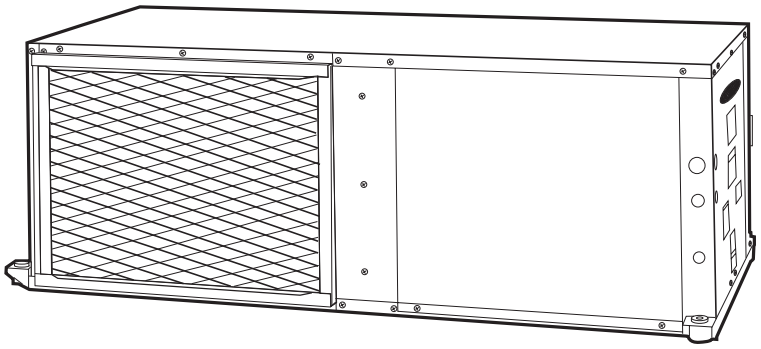
Carrier®

Product Data

Aquazone™
50RHE006-060
Water Source Heat Pumps
Horizontal Unit
50 Hz, CE Mark
R-407C

1.5 to 13.7 Nominal kW (Cooling)
1.8 to 16. 8 Nominal kW (Heating)

AQUAZONE™



Single-Package Horizontally Mounted Water Source Heat Pumps with Electronic Controls.

- High efficiency design with environmentally friendly HFC-407C refrigerant
- Performance rated in accordance with ISO 13256-1
- Wide application use with an operating temperature range of –6.7 C to 43.3 C
- Thermostatic expansion valve (TXV) provides efficient and reliable refrigerant flow
- Available mute package for extra-quiet operation
- Three service panels for compressor section for easy maintenance
- Spring-mounted compressors for quiet operation
- Ease of installation with factory mounted flow regulators and control valves
- Flexible and reliable controls accommodate all systems

Features/Benefits

Carrier's Aquazone high efficiency water source heat pumps are a flexible alternative for all boiler/tower and geothermal design applications

Operating efficiency

Carrier horizontal water source heat pumps are designed for quality and high performance over a lifetime of operation. Aquazone high efficiency units offer cooling COP to 4.6 and heating COPs to 4.7. Efficiencies stated are in accordance with standard conditions under ISO (International Organization for Standardization) Standard 13256-1 and provide among the highest ratings in the industry.

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High quality construction and testing

All units are manufactured to meet extensive quality control protocol from start to finish through an automated control system, which provides continuous monitoring of each unit and performs quality control checks as equipment progresses through the production process. Standard construction features of the Carrier Aquazone™ units include:

Cabinet — Standard unit fabrication consists of heavy gage galvanized sheet metal cabinet construction designed for part standardization (i.e., minimal number of parts) and modular design. Cabinet interior surfaces are lined with $1/2$ in. thick, $1\,1/2$ lb (12.7 mm thick, 0.7 kg) acoustic type insulation. Sheet metal surfaces are treated for maximum corrosion protection to ensure resilience for long term vitality. Compact cabinet dimensions are designed to fit tight space limitations in both horizontal and vertical configurations.

Compressor — Aquazone high efficiency units include a rotary compressor design in size 006 through 015, reciprocating compressor in sizes 019 through 048, and scroll compressor in size 060. Compressor isolating springs are specially selected for each compressor size. The external springs are mounted on an isolated railing system (i.e., from the cabinet) that maximizes vibration isolation and minimizes transmission to the unit structure.

Blower and motor assembly — Permanent split capacitor (PSC) three-speed blowers are provided with all units to satisfy many air distribution applications. Blowers provide upgrade on certain sizes for high static conditions and fan speed control to accommodate reduced sound operation. Blowers also provide dehumidification control with the correct controller option. Blower motors are designed to operate at lower temperatures to help improve the reliability of the water source heat pump.

Refrigeration/water circuit — Units have a sealed refrigerant circuit including a rotary, reciprocating, or scroll compressor. Refrigerant circuits are provided with a standard thermostatic expansion valve (TXV) for higher accuracy and performance. Also standard are a reversing valve (4-way valve), water-to-refrigerant coaxial (tube in tube) coil, and enhanced aluminum fin/rifled copper tube air to refrigerant heat exchanger coil.

Performance — Aquazone units are factory tested under normal ISO 13256-1 operating conditions at nominal water flow rates. Quality assurance is provided via testing report cards shipped with each unit to indicate specific unit performance under cooling and heating modes of operation.

Quiet operation

Fan motor insulation and compressor springs are provided for sound isolation, cabinets are fully insulated to reduce noise transmission, low speed blowers are utilized for quiet operation through reduced outlet air velocities, and air-to-refrigerant coils are designed for lower airflow coil face velocities.

Design flexibility

Airflow configurations for horizontal units are available in four patterns including left or right return, and left, right, or back discharge. Horizontal units are field convertible from left or right discharge to back discharge. Extended water temperature range between –6.7 C and 43.3 C offers maximum design flexibility for all applications. Water flow rates as low as 0.027 L/s per kW assist with selection from a various range of circulating pumps. Factory-installed options are offered to meet specific design requirements.

Safe, reliable operation

Standard safety features for the refrigerant circuit include high-pressure switch, low-pressure sensor to detect loss of refrigerant and low air temperature sensor to safeguard against freezing. Equipment safety features include water loop temperature monitoring, voltage protection, water coil freeze protection, and standard electronic condensate overflow shutdown. All safety features are tested and run at the factory to assure proper operation of all components and safety switches.

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Features/Benefits (cont)

All components are carefully designed and selected for endurance, durability, and carefree day-to-day operation.

The Aquazone™ unit is shipped to provide internal and external equipment protection. Shipping supports are placed under the blower housing and compressor feet. In addition, horizontal units are mounted on oversized pallets with lag bolts for sturdiness and maximum protection during transit.

Ease of installation

The Aquazone unit is packaged for simple low cost handling, with minimal time required for installation. All units are pre-wired and factory charged with refrigerant. Horizontal units are provided with factory-installed hangar isolation brackets. Water connections (FPT) and condensate drains (FPT) are anchored securely to the unit cabinet.

Simple maintenance and serviceability

The Aquazone WSHP units are constructed to provide ease of maintenance. All units allow access to compressor section from 3 sides and have large removable panels for easy access. Additional panels are provided to access the blower and control box sections.

The blower housing assembly can be serviced without disconnecting ductwork from the dedicated blower access panel. Blower units are provided with permanently lubricated bearings for worry-free performance. Blower inlet rings allow removal of the blower wheel without having to remove the housing or ductwork connections.

Electrical disconnection of the blower motor and control box is easily accomplished from quick disconnects on each component.

Easy removal of the control box from the unit provides access to all refrigeration components.

The refrigeration circuit is easily tested and serviced through the use of high and low pressure ports integral to the refrigeration circuit.

Maximum control flexibility

Aquazone water source heat pumps provide reliable control operation using a standard microprocessor board with many intelligent features.

Carrier's Aquazone standard unit solid-state control system, the Complete C, provides control of the unit compressor, reversing valve, fan, safety features, and troubleshooting fault indication features. The Complete C is one of the most user friendly, low cost, and advanced control boards found in the WSHP industry. Many features are field selectable to provide the ultimate in field installation flexibility. The overall features of this standard control system include:

50 va transformer — Assists in accommodating accessory loads.

Anti-short cycle timer — Provides a minimum off time to prevent the unit from short cycling. The 5-minute timer energizes when the compressor is deenergized, resulting in a 5-minute delay before the unit can be restarted.

Random start relay — Ensures a random delay in energizing each different WSHP unit. This option minimizes peak electrical demand during start-up from different operating modes or after building power outages.

High and low pressure refrigerant protection — Safeguards against unreliable unit operation and prevents refrigerant from leaking.

Condensate overflow sensor — Electronic sensor mounted to the drain pan. When condensate pan liquid reaches an unacceptable level, unit is automatically deactivated and placed in a lockout condition. Thirty continuous seconds of overflow is recognized as a fault by the sensor.

High and low voltage protection — Safety protection for excessive or low voltage conditions.

Automatic intelligent reset — Unit shall automatically restart 5 minutes after shutdown if the fault has cleared. Should a fault occur 3 times sequentially, lockout will occur.

Accessory output — A 24-v output is provided to cycle a motorized water valve or damper actuator with compressor in applications such as variable speed pumping arrangements.

Performance Monitor (PM) — Unique feature monitors water temperatures to warn when the heat pump is operating inefficiently or beyond typical operating range. Field selectable switch initiates a warning code on the unit display.

Water coil freeze protection (selectable for water or antifreeze) — Field selectable switch for water and water/glycol solution systems initiates a fault when temperatures exceed the selected limit for 30 continuous seconds.

Air coil freeze protection (check filter operation) — Field selectable switch for assessing excessive filter pressure drop initiates a fault when temperatures exceed the selected limit for 30 continuous seconds.

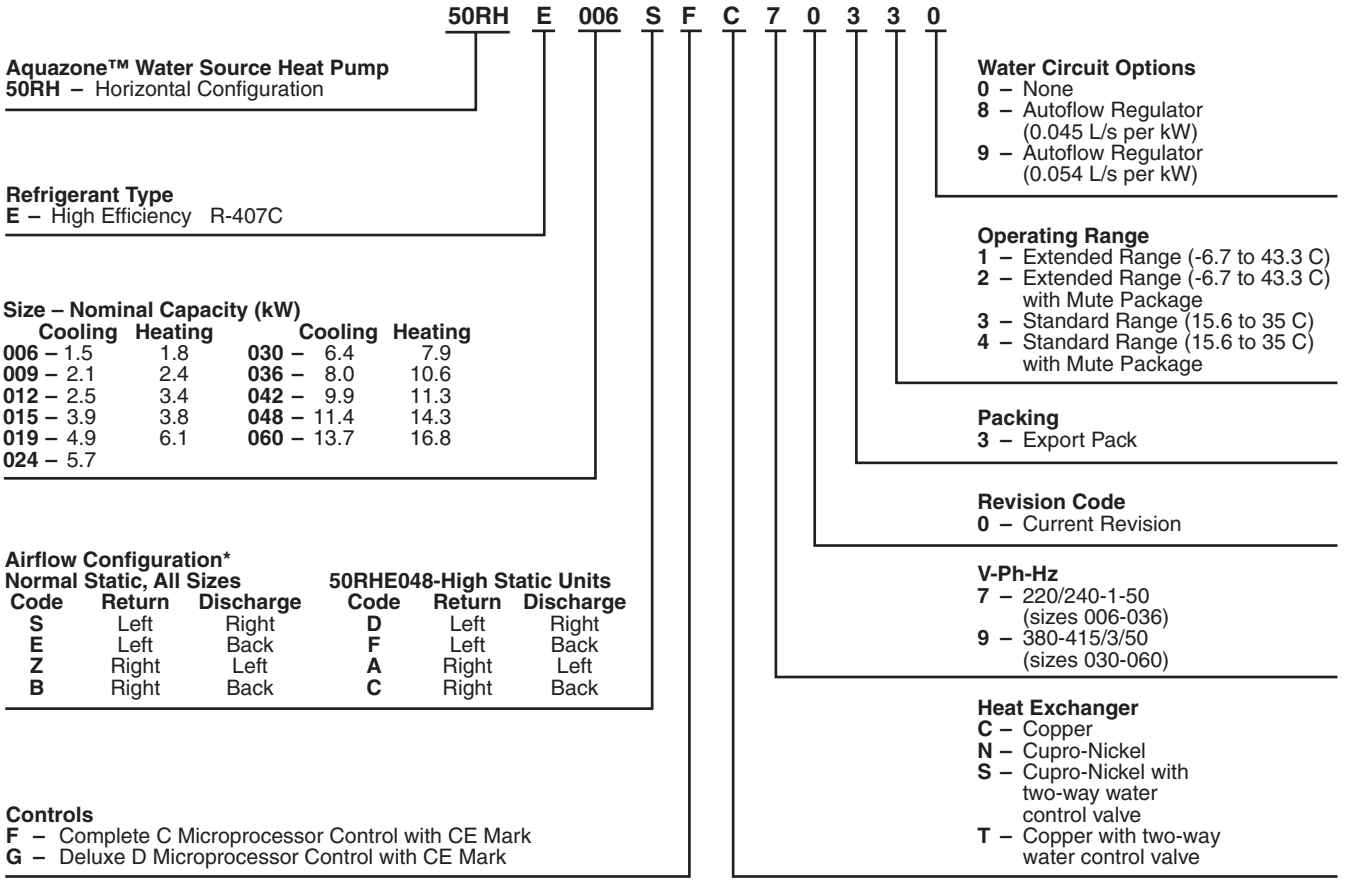
Alarm relay setting — Selectable 24-v or pilot duty dry contact for providing activation of a remote alarm.

Electric heat option — Output provided on the controller for operating two stages of emergency electric heat.

Service test mode with diagnostic LED (light-emitting diode) — The Test mode allows service personnel to check the operation of the WSHP and control system efficiently. Upon entering Test mode, time delays are sped up, and the Status LED will flash a code to indicate the last fault experienced for easy diagnosis. Based on the fault code flashed by the status LED, system diagnostics are assisted through the use of Carrier provided troubleshooting tables for easy reference to typical problems.

LED visual output — An LED panel indicates high pressure, low pressure, low voltage, high voltage, air/water freeze protection, condensate overflow, and control status.

Model number nomenclature


50RH E 006 S F C 7 0 3 3 0
Aquazone™ Water Source Heat Pump
50RH – Horizontal Configuration
Refrigerant Type
E – High Efficiency R-407C
Size – Nominal Capacity (kW)
Cooling Heating Cooling Heating
006 – 1.5 1.8 030 – 6.4 7.9
009 – 2.1 2.4 036 – 8.0 10.6
012 – 2.5 3.4 042 – 9.9 11.3
015 – 3.9 3.8 048 – 11.4 14.3
019 – 4.9 6.1 060 – 13.7 16.8
024 – 5.7
Airflow Configuration*
Normal Static, All Sizes
Code Return Discharge
S Left Right
E Left Back
Z Right Left
B Right Back
50RHE048-High Static Units
Code Return Discharge
D Left Right
F Left Back
A Right Left
C Right Back
Controls
F – Complete C Microprocessor Control with CE Mark
G – Deluxe D Microprocessor Control with CE Mark
Heat Exchanger
C – Copper
N – Cupro-Nickel
S – Cupro-Nickel with two-way water control valve
T – Copper with two-way water control valve
V-Ph-Hz
7 – 220/240-1-50 (sizes 006-036)
9 – 380-415/3/50 (sizes 030-060)
Revision Code
0 – Current Revision
Packing
3 – Export Pack
Operating Range
1 – Extended Range (-6.7 to 43.3 C)
2 – Extended Range (-6.7 to 43.3 C) with Mute Package
3 – Standard Range (15.6 to 35 C)
4 – Standard Range (15.6 to 35 C) with Mute Package
Water Circuit Options
0 – None
8 – Autoflow Regulator (0.045 L/s per kW)
9 – Autoflow Regulator (0.054 L/s per kW)

*Right and left hand orientation is determined by looking at water connection side (front).

ISO* 13256-1 capacity ratings

50RHE WATER LOOP APPLICATIONS

UNIT 50RHE	PRESSURE DROP	LIQUID FLOW (L/s)	AIRFLOW (L/s)	EWT			
				Cooling 30 C		Heating 20 C	
	kPa			TC	COP	TC	COP
006	6.8	0.069	81	1 500	3.3	1 800	3.9
009	9.9	0.107	113	2 100	4.0	2 400	4.2
012	34.3	0.145	140	2 500	3.1	3 400	3.7
015	27.0	0.164	212	3 900	4.6	3 800	4.7
019	19.1	0.215	264	4 900	3.3	6 100	4.0
024	23.7	0.284	307	5 700	3.4	7 000	4.0
030	13.9	0.347	349	6 400	3.3	7 900	4.0
036	12.2	0.429	437	8 000	3.3	10 600	4.0
042	16.3	0.498	530	9 900	3.7	11 300	4.4
048	22.3	0.568	630	11 400	3.6	14 300	4.1
060	32.5	0.713	790	13 700	3.4	16 800	4.3

LEGEND

COP — Coefficient of Performance
EWT — Entering Water Temperature
TC — Total Capacity (Watts)

NOTES:
1. A water-to-air heat pump using water or brine circulating in a common piping loop functioning as a heat source/heat sink.
2. The temperature of the water or brine loop is usually mechanically controlled within a temperature range of 15.6 C to 35 C.
3. Rated in accordance with the ISO Standard 13256-1.

50RHE GROUND LOOP APPLICATIONS

UNIT 50RHE	PRESSURE DROP	LIQUID FLOW (L/s)	AIRFLOW (L/s)	EWT			
				Cooling 25 C		Heating 0° C	
	kPa			TC	COP	TC	COP
006	6.8	0.069	81	1 600	3.9	1 200	3.0
009	9.9	0.107	113	2 200	4.7	1 600	3.3
012	34.3	0.145	140	2 700	3.6	2 200	3.0
015	27.0	0.164	212	4 100	5.3	2 600	3.7
019	19.1	0.215	264	5 300	3.8	3 600	3.1
024	23.7	0.284	307	6 100	3.9	4 400	3.3
030	13.9	0.347	349	6 800	3.8	5 100	3.2
036	12.2	0.429	437	8 500	3.7	6 800	3.3
042	16.3	0.498	530	10 800	4.4	7 500	3.6
048	22.3	0.568	630	12 000	4.1	8 400	3.4
060	32.5	0.713	790	14 500	4.0	11 200	3.3

LEGEND

COP — Coefficient of Performance
EWT — Entering Water Temperature
TC — Total Capacity (Watts)

NOTES:
1. A water-to-air heat pump using water or brine circulating in a common piping loop functioning as a heat source/heat sink.
2. The temperature of the water or brine loop is usually mechanically controlled within a temperature range of –6.7 C to 43.3 C.
3. Rated in accordance with the ISO Standard 13256-1.

50RHE GROUND WATER APPLICATIONS

UNIT 50RHE	PRESSURE DROP	LIQUID FLOW (L/s)	AIRFLOW (L/s)	EWT			
				Cooling 15 C		Heating 10 C	
	kPa			TC	COP	TC	COP
006	6.8	0.069	81	1 800	5.3	1 500	3.4
009	9.9	0.107	113	2 500	6.3	2 000	3.8
012	34.3	0.145	140	3 100	4.8	2 800	3.4
015	27.0	0.164	212	4 500	6.8	3 100	4.2
019	19.1	0.215	264	5 900	4.8	4 800	3.6
024	23.7	0.284	307	6 800	5.0	5 700	3.7
030	13.9	0.347	349	7 400	4.9	6 400	3.7
036	12.2	0.429	437	9 300	4.6	8 700	3.7
042	16.3	0.498	530	12 200	5.8	9 500	4.0
048	22.3	0.568	630	13 100	5.2	11 400	3.7
060	32.5	0.713	790	15 900	5.2	13 800	3.8

*International Organization for Standardization.

LEGEND

COP — Coefficient of Performance
EWT — Entering Water Temperature
TC — Total Capacity (Watts)

NOTES:
1. A water-to-air heat pump using water pumped from a well, lake or stream functioning as a heat source/heat sink.
2. The temperature of the water is related to the climatic conditions and may vary from 4.4 C to 26.7 C.
3. Rated in accordance with the ARI/ISO Standard 13256-1.

ISO capacity notes

1. Cooling capacities based upon 27 C DB (dry bulb), 19 C WB (wet bulb) entering-air temperature.
2. Heating capacities based upon 20 C DB, 15 C WB entering-air temperature.
3. All ratings based upon operation at lower voltage of dual voltage rated models.
4. All airflow is rated on high speed.

Options and accessories

Factory-installed options

Cupronickel heat exchangers are available for higher corrosion protection for applications such as open tower, geothermal, etc. Consult the water quality guidelines for proper application and selection of this option.

Sound attenuation package (mute package) is available for applications that require especially low noise levels. With this option, a double application of sound attenuating material is applied, access panels are double dampened with 12.7-mm. thick density fiberglass insulation, and a unique application of special dampening material is applied to the curved portion of the blower. The mute package, in combination with standard unit noise reduction features mentioned previously, provides sound levels and noise reduction to the highest degree.

Extended range is provided to insulate the coaxial coil to prevent condensation, and therefore potential dripping problems, in applications where the entering water temperature is below the normal operating range (less than 15.6 C).

High-static blower is available in size 048. This option provides increased airflow at various static pressure conditions to provide even more flexibility to Carrier's high blower performance in the standard offering for each model number.

Deluxe D control system provides the same functions as the Complete C control system while incorporating additional flexibility and functions to include:

Thermostat input capabilities — Accommodate emergency shutdown mode and night setback with override (NSB) functions. Night setback from low temperature thermostat with 2-hour override is initiated by a momentary signal from the thermostat.

Compressor relay staging — Used with dual stage units (units with 2 compressors and 2 Deluxe D controls) or in master/slave applications.

Boilerless electric heat control system — Allows automatic changeover to electric heat at low loop water temperature.

Intelligent reversing valve operation — Minimizes reversing valve operation for extended life and quiet operation.

Thermostat type select (Y, O or Y, W) — Provides ability to operate and select heat pump or heat/cool thermostats (Y, W).

Reversing valve signal select (O or B) — Provides selection for heat pump O/B thermostats.

Dehumidistat input — Provides operation of fan control for dehumidification operation.

Multiple units on one thermostat/wall sensor — Provides for communication for up to three heat pumps on one thermostat.

Boilerless changeover temperature — Provides selection of boilerless changeover temperature set point.

Accessory relays — Allow configuration for multiple applications including fan and compressor cycling, digital night setback (NSB), mechanical night setback, water valve operation, and outside air damper operation.

Water circuit options to provide internally mounted 0.045 or 0.054 L/s per kW automatic flow regulating valves for easier installation.

Two-way motorized control valve can be provided for applications involving open type systems or variable speed pumping. This valve will slowly open and close in conjunction with the compressor operation to shut off or turn on water to the unit.

Field-installed accessories

Carrier's line of Aquazone™ thermostats are both attractive and multi-functional, accommodating stand-alone water source heat pump installations.

Programmable 7-day thermostat — Fully electronic 24-vac thermostat offers 2-stage heat, 2-stage cool, auto changeover, 7-day programmable operation with copy command and 4 settings per day. Other features include backlit LCD, keypad lockout, no batteries required, 5-minute compressor protection, NEVERLOST™ memory, 3 security levels, temperature display in degrees C or F.

Programmable 7-day light-activated thermostat — Offers same features as the 7-day programmable thermostat and includes occupied comfort settings with lights on, unoccupied energy savings with lights off.

Programmable 7-day flush-mount thermostat — Offers same features as the 7-day programmable thermostat and includes locking coverplate with tamper proof screws, flush to wall mount, holiday/vacation programming, set point limiting, dual point with adjustable deadband, O or B terminal, and optional wall or duct-mounted remote sensor.

Programmable 5-day thermostat — Offers 2-stage heat, 2-stage cool, auto changeover, 5-minute built-in compressor protection, locking cover included, temperature display in degrees C or F, keypad lockout, backlit display, 5-1-1 programming, O or B terminal, dual set point with adjustable deadband, configurable display, self-prompting program, 4 settings per day.

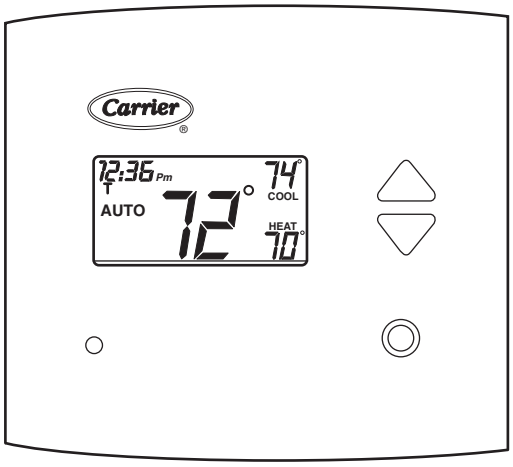
Non-programmable thermostat — Offers 2 heat stages, 2 cool stages, auto changeover, 5-minute built in compressor protection, locking cover included, temperature display in degrees C or F, keypad lockout, large display, backlit display, O or B terminal, dual set point with adjustable deadband, backplate with terminals.

Loop controller with six stages (2 stages for heating and 4 stages for heat rejection) which includes:

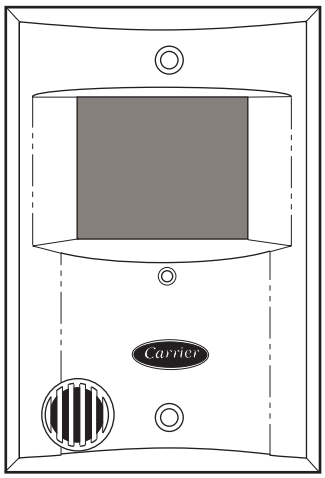
- Loop temperature alarms
- Two pump single loop flow monitoring with the ability to manually select the lead pump
- One common alarm signal and indicating light and one audible alarm
- Loop water temperature sensor test circuit
- Functional test simulation from operator keypad
- Real timeclock, industrial noise ratings
- Loop water temperature control switch.
- Loop controller with six stages (2 stages for heating and 4 stages for cooling)

Filter rack (2 in. [50.8 mm]) is available in place of the standard 1-in. (25.4 mm) return air filter to enhance the filtration system of the water source heat pump. The 2-in. filter rack does not include filters.

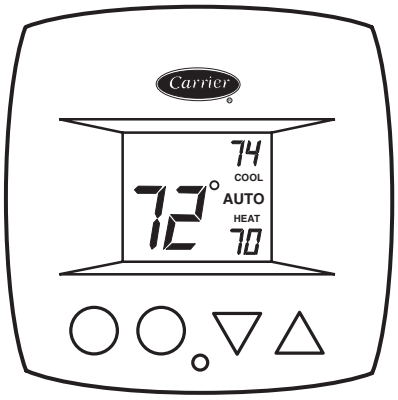
CARRIER AQUAZONE™ THERMOSTATS



7-DAY PROGRAMMABLE/LIGHT-ACTIVATED PROGRAMMABLE



7-DAY PROGRAMMABLE FLUSH MOUNT



5-DAY PROGRAMMABLE/NON-PROGRAMMABLE

Physical data

AQUAZONE 50RHE006-060 UNITS

UNIT 50RHE	006	009	012	015	019	024	030	036	042	048	060
COMPRESSOR (1 each)	Rotary				Reciprocating						Scroll
FACTORY CHARGE R-407C (kg)	0.34	0.37	0.37	0.68	0.88	0.91	1.19	1.36	1.19	1.59	2.41
PSC FAN MOTOR AND BLOWER											
Fan Motor Type/Speeds	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3
Fan Motor (Hp) [w]	1/25 [30]	1/10 [75]	1/10 [75]	1/6 [124]	1/5 [150]	1/3 [250]	1/2 [373]	3/4 [560]	3/4 [560]	3/4 [560]	1 [746]
Blower Wheel Size (D x W) (mm)	127 x 127	127 x 127	152 x 127	152 x 127	152 x 127	152 x 127	152 x 127	254 x 254	254 x 254	254 x 254	279 x 254
WATER CONNECTION SIZE (in.) (FPT)	1/2	1/2	1/2	3/4	3/4	3/4	3/4	3/4	1	1	1
HORIZONTAL											
Air Coil											
Dimensions (H x W) (mm)	254 x 406			406 x 406			457 x 559		457 x 787		508 x 889
Total Face Area (m^2)	0.103			0.165			0.255		0.360		0.452
Tube Size (mm)	9.5			9.5			9.5		9.5		9.5
Distance Between Fins (mm)	2.2			2.2			2.2		2.2		2.7
Number of Rows	2		3	3			3		3		4
Filter Standard 25.4-mm Throwaway (Qty — Size, mm)	1 — 254 x 508			1 — 406 x 508			1 — 457 x 610		2 — 457 x 457		1 — 305 x 508 1 — 635 x 508
Weight (kg)											
Operating	50.0	50.9	55.0	66.8	76.8	87.7	99.5	104.1	116.8	121.4	146.8
Packaged	54.5	55.5	59.5	71.4	81.4	92.3	105.0	109.5	122.3	126.8	153.6

LEGEND

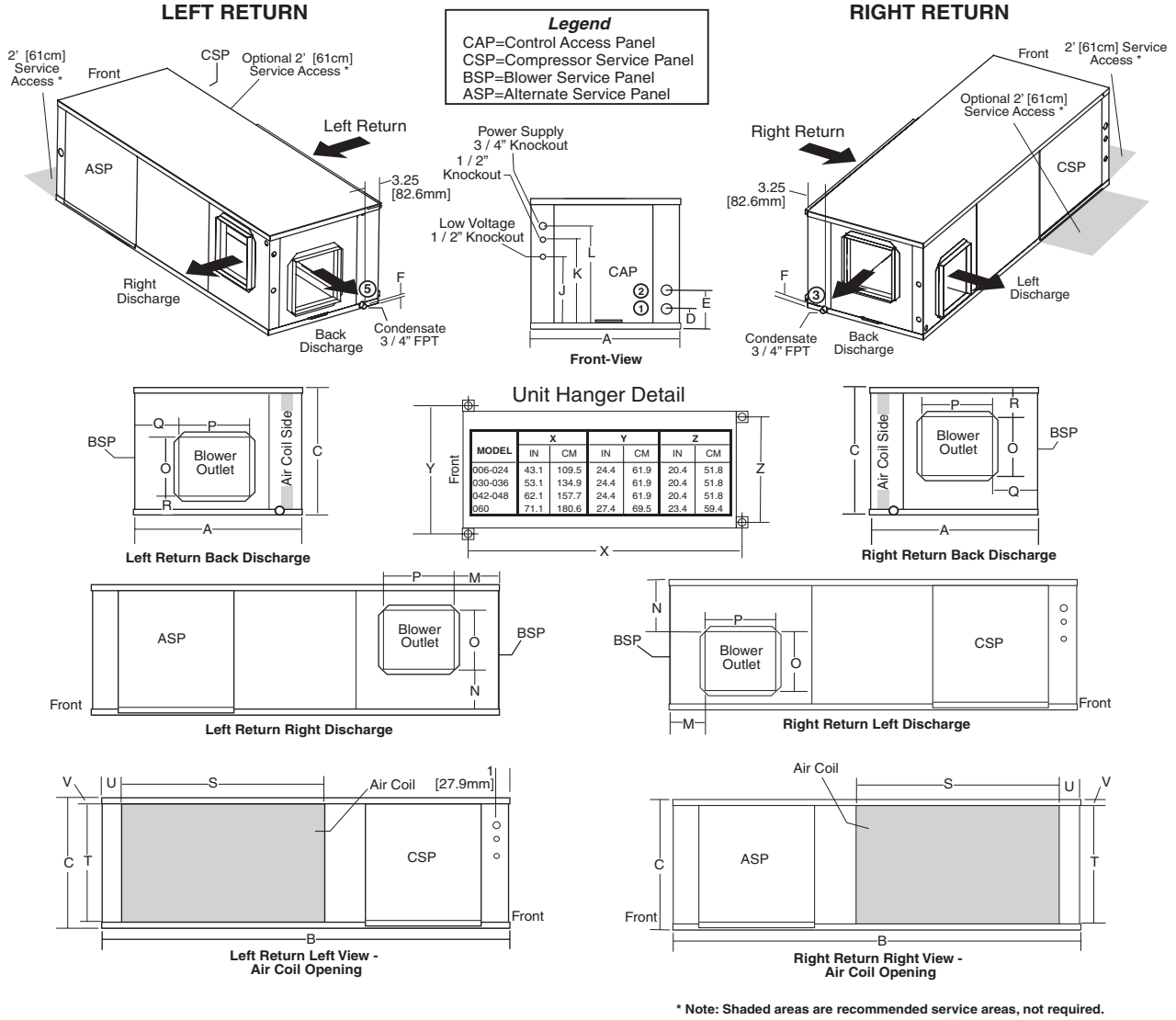
PSC — Permanent Split Capacitor

NOTES:
1. All units have spring compressor mountings, TXV (thermostatic expansion valve) expansion devices, and 1/2- and 3/4-in. electrical knockouts.
2. Size 048 available as high-static unit.

Dimensions

50RHE UNITS		OVERALL CABINET			WATER CONNECTIONS				ELECTRICAL KNOCKOUTS (in.)			DISCHARGE CONNECTION Duct Flange Installed (±0.10 in.)						RETURN CONNECTION Using Return Air Opening			
					1	2	3	Loop Water FPT (in.)	J 1/2 conduit	K 1/2 conduit	L 3/4 conduit										
		A Width	B Depth	C Height	D In	E Out	F Condensate		Low Voltage	Ext Pump	Power Supply	M	N	O Supply Height	P Supply Depth	Q	R	S Return Depth	T Return Height	U	V
006-012	in.	22.4	43.1	11.3	2.4	5.4	0.6	1/2	3.5	5.5	8.2	5.8	4.0	5.8	8.0	5.8	1.5	17.1	9.3	2.2	1.0
	cm	56.8	109.5	28.7	6.1	13.7	1.5		8.9	14.0	20.8	14.7	10.2	14.7	20.3	14.7	3.8	43.4	23.6	5.6	2.5
015-024	in.	22.4	43.1	17.3	2.4	4.9	0.6	3/4	3.5	7.5	10.2	5.0	5.6	10.4	9.3	5.0	1.5	17.1	15.3	2.2	1.0
	cm	56.8	109.5	43.9	6.1	12.4	1.5		8.9	19.1	25.9	12.7	14.2	26.4	23.6	12.7	3.8	43.4	38.9	5.6	2.5
030	in.	22.4	53.2	19.3	2.4	5.4	0.6	3/4	5.7	9.7	12.2	5.0	6.8	10.4	9.3	5.0	2.1	23.1	17.3	2.2	1.0
	cm	56.8	135.1	49.0	6.1	13.7	1.5		14.5	24.6	31.0	12.7	17.3	26.4	23.6	12.7	5.3	58.7	43.9	5.6	2.5
036	in.	22.4	53.2	19.3	2.4	5.4	0.6	3/4	5.7	9.7	12.2	2.9	3.8	13.5	13.1	2.9	1.9	23.1	17.3	2.2	1.0
	cm	56.8	135.1	49.0	6.1	13.7	1.5		14.5	24.6	31.0	7.4	9.7	34.3	33.3	7.4	4.8	58.7	43.9	5.6	2.5
042-048	in.	22.4	62.2	19.3	2.4	5.4	0.6	1	5.7	9.7	12.2	2.9	3.8	13.5	13.1	2.9	1.9	32.1	17.3	2.2	1.0
	cm	56.8	158.0	49.0	6.1	13.7	1.5		14.5	24.6	31.0	7.4	9.7	34.3	33.3	7.4	4.8	81.5	43.9	5.6	2.5
060	in.	25.4	71.2	21.3	2.4	5.4	0.6	1	8.1	11.7	14.2	5.8	5.0	13.6	13.3	5.8	2.9	36.1	19.3	2.2	1.0
	cm	64.5	180.8	54.1	6.1	13.7	1.5		20.6	29.7	36.1	14.7	12.7	34.5	33.8	14.7	7.4	91.7	49.0	5.6	2.5

NOTES:
1. Condensate is 3/4-in. FPT copper.
2. Horizontal unit shipped with filter bracket only. This bracket should be removed for return duct connection.
3. Hanger kit is factory installed. Isolation grommets are provided.
4. Right and left orientation is determined by looking at water connection side (front).



MODEL	X		Y		Z	
	IN	CM	IN	CM	IN	CM
006-024	43.1	109.5	24.4	61.9	20.4	51.8
030-036	53.1	134.9	24.4	61.9	20.4	51.8
042-048	62.1	157.7	24.4	61.9	20.4	51.8
060	71.1	180.6	27.4	69.5	23.4	59.4

*** Note: Shaded areas are recommended service areas, not required.**

Selection procedure (with 50RHE024 example)

I Determine the actual cooling and heating loads at the desired dry bulb and wet bulb conditions.

Assume cooling load at desired dry bulb 27 C and wet bulb 17 C conditions are as follows:

Given:

Total Cooling (TC) . . . . . .5.4 kW

Sensible Cooling (SC) . . . . . .4.3 kW

Entering-Air Temperature db . . . . . 27 C

Entering-Air Temperature wb . . . . . 17 C

II Determine the following design parameters.

Entering water temperature, water flow rate (l/s), airflow (l/s), water flow pressure drop and design wet and dry bulb temperatures. Airflow l/s should be between 40 and 60 l/s per kW. For applications using multiple units, the unit water pressure drop should be kept as close as possible across unit to make water balancing easier. Enter the 50RHE024 Performance Data tables and find the proper indicated water flow and water temperature.

For example:

Entering Water Temp . . . . . 30 C

Water Flow (Based upon
6.7 C rise in temp) . . . . . 0.284 l/s

Airflow. . . . . .230 l/s

III Select a unit based on total cooling and total sensible cooling conditions. Unit selected should be closest to but not larger than the actual cooling load.

Enter tables at the design water flow and water temperature. Read the total and sensible cooling capacities.

NOTE: Interpolation is permissible, extrapolation is not.

For example:

Enter the 50RHE024 Performance Table at design water flow and water temperature. Read Total Cooling, Sensible Cooling and Heat of Rejection capacities:

Total Cooling . . . . . .5.6 kW

Sensible Cooling . . . . . 4.4 kW

Heat of Rejection . . . . . .7.3 kW

Read the Heat Capacity. If the Heat Capacity exceeds the design criteria, it is acceptable.

NOTE: It is quite normal for water source heat pumps to be selected on cooling capacity only since the heating output is usually greater than the cooling capacity.

IV Determine the correction factors associated with the variable factors of dry bulb and wet bulb using the Corrections Factor tables found in this book.

Using the following formulas to determine the correction factors of dry bulb and wet bulb:

a) Corrected Total Cooling = tabulated total cooling x wet bulb correction x airflow correction.

b) Corrected Sensible Cooling = tabulated sensible cooling x wet/dry bulb correction x airflow correction

V Determine entering air and airflow correction using the Corrections Factor tables found in this book.

The nominal airflow for 50RHE024 is 307 l/s. The design parameter is 230 l/s.

230/307 = 75% of nominal airflow.

Use the 75% row in the Nominal Cfm Correction table.

The Entering Air Temperature wb is 17 C. Use the 17 C row in the Entering Air Correction table.

Using the following formulas to determine the correction factors of entering air and airflow correction:

		Table		Ent Air		Airflow		Corrected
Corrected Total Cooling	=	5.6	x	0.956	x	0.954	=	5.1
Corrected Sensible Cooling	=	4.4	x	1.142	x	0.863	=	4.3
Corrected Heat of Rejection	=	7.3	x	0.963	x	0.954	=	6.7

Compare the corrected capacities to the load requirements established in Step I. If the capacities are within 10% of the load requirements, the equipment is acceptable. It is better to undersize than oversize as undersizing improves humidity control, reduces sound levels and extends the life of the equipment.

VI Water temperature rise calculation and assessment.

Calculate the water temperature rise and assess the selection using the following calculation:

$$\text{Actual Temperature Rise} = \frac{\text{Correction of Heat Rejection}}{\text{l/s} \times 4.16}$$

For example, using the Corrected Heat of Rejection from the last step:

$$\text{Actual Temperature Rise} = \frac{6.7}{0.284 \times 4.16} = 5.7 \text{ C}$$

If the units selected are not within 10% of the load calculations, review what effect changing the liquid flow rate, water temperature and/or airflow will have on the corrected capacities. If the desired capacity cannot be achieved, select the next larger or smaller unit and repeat Steps I through VI.

Performance data

50RHE006

81 L/S NOMINAL AIRFLOW

EWT (C)	LIQUID FLOW (L/s)	PRESSURE DROP (kPa)	COOLING CAPACITY				HEATING CAPACITY		
			TC (kW)	SC (kW)	Power Input (kW)	THR (kW)	TC (kW)	Power Input (kW)	THA (kW)
–5	0.050	6.0	Operation Not Recommended						
	0.069	8.4					1.1	0.40	0.7
	0.095	14.4					1.1	0.40	0.7
0	0.050	5.8	2.0	1.4	0.30	2.3	1.2	0.41	0.8
	0.069	8.2	2.1	1.4	0.29	2.3	1.2	0.42	0.8
	0.095	13.9	2.1	1.4	0.29	2.4	1.2	0.42	0.8
5	0.050	5.6	1.9	1.3	0.33	2.3	1.3	0.43	0.9
	0.069	7.9	2.0	1.3	0.31	2.3	1.3	0.43	0.9
	0.095	13.5	2.0	1.4	0.30	2.3	1.4	0.43	0.9
10	0.050	5.4	1.8	1.3	0.36	2.2	1.4	0.44	1.0
	0.069	7.7	1.9	1.3	0.34	2.2	1.5	0.45	1.0
	0.095	13.0	1.9	1.3	0.33	2.3	1.5	0.45	1.1
15	0.050	5.3	1.7	1.3	0.39	2.1	1.6	0.46	1.1
	0.069	7.4	1.8	1.3	0.37	2.2	1.6	0.46	1.2
	0.095	12.6	1.8	1.3	0.36	2.2	1.7	0.47	1.2
20	0.050	5.1	1.6	1.2	0.42	2.1	1.7	0.47	1.3
	0.069	7.2	1.7	1.3	0.40	2.1	1.8	0.48	1.3
	0.095	12.2	1.7	1.3	0.39	2.1	1.8	0.48	1.4
25	0.050	5.0	1.5	1.2	0.46	2.0	1.9	0.49	1.4
	0.069	7.0	1.6	1.2	0.44	2.0	2.0	0.49	1.5
	0.095	11.9	1.6	1.2	0.43	2.0	2.0	0.50	1.5
30	0.050	4.8	1.4	1.1	0.49	1.9	2.0	0.50	1.5
	0.069	6.8	1.5	1.2	0.47	1.9	2.1	0.51	1.6
	0.095	11.5	1.5	1.2	0.46	2.0	2.1	0.51	1.6
35	0.050	4.7	1.3	1.1	0.53	1.8	Operation Not Recommended		
	0.069	6.6	1.4	1.1	0.51	1.9			
	0.095	11.2	1.4	1.1	0.50	1.9			
40	0.050	4.6	1.2	1.0	0.56	1.7			
	0.069	6.5	1.2	1.0	0.54	1.8			
	0.095	11.0	1.3	1.1	0.53	1.8			
45	0.050	4.8	1.1	1.0	0.58	1.6			
	0.069	6.2	1.1	1.0	0.57	1.7			
	0.095	11.0	1.2	1.0	0.56	1.7			

LEGEND

EWT — Entering Water Temperature (C)
SC — Sensible Capacity
TC — Total Capacity
THA — Total Heat of Absorption
THR — Total Heat of Rejection

NOTES:

1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 27 C db (dry bulb) and 19 C wb (wet bulb) in cooling and 20 C db in heating.
3. All performance data is based upon the lower voltage of dual voltage rated units.
4. Operation below 15 C EWT requires optional insulated water circuit.
5. Operation below 5 C EWT is based upon 15% antifreeze solution.
6. See Correction Factor tables for operating conditions other than those listed above.
7. Table does not reflect fan or pump power ISO corrections.

50RHE009
113 L/S NOMINAL AIRFLOW

EWT (C)	LIQUID FLOW (L/s)	PRESSURE DROP	COOLING CAPACITY				HEATING CAPACITY		
		(kPa)	TC (kW)	SC (kW)	Power Input (kW)	THR (kW)	TC (kW)	Power Input (kW)	THA (kW)
–5	0.069	8.2	Operation Not Recommended						
	0.107	12.3					1.5	0.49	1.0
	0.139	24.6					1.5	0.49	1.0
0	0.069	7.9	2.8	1.8	0.36	3.2	1.6	0.50	1.1
	0.107	11.9	2.9	1.8	0.35	3.3	1.6	0.51	1.1
	0.139	23.8	2.9	1.8	0.34	3.3	1.7	0.51	1.2
5	0.069	7.7	2.7	1.7	0.39	3.1	1.8	0.52	1.2
	0.107	11.5	2.8	1.7	0.37	3.2	1.8	0.53	1.3
	0.139	23.1	2.8	1.8	0.36	3.2	1.9	0.53	1.3
10	0.069	7.4	2.6	1.7	0.42	3.0	2.0	0.55	1.4
	0.107	11.2	2.7	1.7	0.40	3.1	2.0	0.55	1.5
	0.139	22.3	2.7	1.7	0.39	3.1	2.1	0.56	1.5
15	0.069	7.2	2.4	1.6	0.46	2.9	2.2	0.57	1.6
	0.107	10.8	2.5	1.7	0.43	3.0	2.3	0.58	1.7
	0.139	21.6	2.6	1.7	0.42	3.0	2.3	0.58	1.7
20	0.069	7.0	2.3	1.6	0.49	2.8	2.4	0.59	1.8
	0.107	10.5	2.4	1.6	0.47	2.8	2.5	0.60	1.9
	0.139	20.9	2.4	1.6	0.46	2.9	2.5	0.61	1.9
25	0.069	6.8	2.1	1.5	0.53	2.6	2.6	0.62	2.0
	0.107	10.2	2.2	1.6	0.51	2.7	2.7	0.63	2.0
	0.139	20.3	2.3	1.6	0.50	2.8	2.7	0.63	2.1
30	0.069	6.6	2.0	1.5	0.57	2.5	2.8	0.64	2.1
	0.107	9.9	2.1	1.5	0.55	2.6	2.8	0.64	2.2
	0.139	19.8	2.1	1.5	0.54	2.6	2.9	0.65	2.2
35	0.069	6.4	1.8	1.4	0.61	2.4	Operation Not Recommended		
	0.107	9.7	1.9	1.4	0.59	2.5			
	0.139	19.3	1.9	1.4	0.58	2.5			
40	0.069	6.3	1.6	1.3	0.65	2.3			
	0.107	9.5	1.7	1.4	0.63	2.4			
	0.139	18.9	1.8	1.4	0.62	2.4			
45	0.069	6.2	1.5	1.2	0.69	2.2			
	0.107	9.7	1.6	1.3	0.67	2.2			
	0.139	18.6	1.6	1.3	0.66	2.3			

LEGEND

EWT — Entering Water Temperature (C)
SC — Sensible Capacity
TC — Total Capacity
THA — Total Heat of Absorption
THR — Total Heat of Rejection

NOTES:
1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 27 C db (dry bulb) and 19 C wb (wet bulb) in cooling and 20 C db in heating.
3. All performance data is based upon the lower voltage of dual voltage rated units.
4. Operation below 15 C EWT requires optional insulated water circuit.
5. Operation below 5 C EWT is based upon 15% antifreeze solution.
6. See Correction Factor tables for operating conditions other than those listed above.
7. Table does not reflect fan or pump power ISO corrections.

Performance data (cont)

50RHE012

140 L/S NOMINAL AIRFLOW

EWT (C)	LIQUID FLOW (L/s)	PRESSURE DROP (kPa)	COOLING CAPACITY				HEATING CAPACITY		
			TC (kW)	SC (kW)	Power Input (kW)	THR (kW)	TC (kW)	Power Input (kW)	THA (kW)
–5	0.095	19.7	Operation Not Recommended						
	0.145	42.7					2.0	0.73	1.3
	0.189	68.1					2.0	0.73	1.3
0	0.095	19.1	3.5	2.4	0.57	4.1	2.2	0.74	1.4
	0.145	41.3	3.6	2.5	0.54	4.1	2.2	0.75	1.5
	0.189	65.9	3.7	2.5	0.53	4.2	2.2	0.76	1.5
5	0.095	18.4	3.3	2.4	0.61	3.9	2.4	0.78	1.6
	0.145	40.0	3.4	2.4	0.58	4.0	2.5	0.79	1.7
	0.189	63.8	3.5	2.4	0.57	4.1	2.5	0.79	1.7
10	0.095	17.9	3.1	2.3	0.66	3.8	2.7	0.82	1.9
	0.145	38.7	3.3	2.4	0.62	3.9	2.8	0.83	2.0
	0.189	61.7	3.3	2.4	0.61	3.9	2.8	0.84	2.0
15	0.095	17.3	3.0	2.2	0.71	3.7	3.0	0.86	2.1
	0.145	37.5	3.1	2.3	0.67	3.8	3.1	0.88	2.2
	0.189	59.8	3.1	2.3	0.66	3.8	3.2	0.89	2.3
20	0.095	16.8	2.8	2.2	0.76	3.5	3.3	0.90	2.4
	0.145	36.3	2.9	2.2	0.73	3.6	3.4	0.92	2.5
	0.189	57.9	2.9	2.2	0.71	3.7	3.5	0.93	2.5
25	0.095	16.3	2.6	2.1	0.82	3.4	3.6	0.94	2.6
	0.145	35.2	2.7	2.1	0.78	3.5	3.7	0.96	2.7
	0.189	56.2	2.8	2.2	0.77	3.5	3.7	0.97	2.8
30	0.095	15.8	2.4	2.0	0.88	3.3	3.8	0.98	2.8
	0.145	34.3	2.5	2.1	0.85	3.3	3.9	0.99	2.9
	0.189	54.7	2.6	2.1	0.83	3.4	3.9	0.99	2.9
35	0.095	15.4	2.2	1.9	0.95	3.1	Operation Not Recommended		
	0.145	33.4	2.3	2.0	0.91	3.2			
	0.189	53.4	2.3	2.0	0.89	3.2			
40	0.095	15.1	2.0	1.8	1.02	3.0			
	0.145	32.8	2.1	1.9	0.98	3.1			
	0.189	52.3	2.1	1.9	0.96	3.1			
45	0.095	10.3	1.8	1.7	1.10	2.9			
	0.158	23.4	1.9	1.7	1.05	2.9			
	0.189	51.7	1.9	1.8	1.04	3.0			

LEGEND

EWT — Entering Water Temperature (C)
SC — Sensible Capacity
TC — Total Capacity
THA — Total Heat of Absorption
THR — Total Heat of Rejection

NOTES:

1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 27 C db (dry bulb) and 19 C wb (wet bulb) in cooling and 20 C db in heating.
3. All performance data is based upon the lower voltage of dual voltage rated units.
4. Operation below 15 C EWT requires optional insulated water circuit.
5. Operation below 5 C EWT is based upon 15% antifreeze solution.
6. See Correction Factor tables for operating conditions other than those listed above.
7. Table does not reflect fan or pump power ISO corrections.

50RHE015
212 L/S NOMINAL AIRFLOW

EWT (C)	LIQUID FLOW (L/s)	PRESSURE DROP (kPa)	COOLING CAPACITY				HEATING CAPACITY		
			TC (kW)	SC (kW)	Power Input (kW)	THR (kW)	TC (kW)	Power Input (kW)	THA (kW)
–5	0.113	17.2	Operation Not Recommended						
	0.164	33.6					2.5	0.74	1.7
	0.221	57.4					2.5	0.74	1.7
0	0.113	16.7	4.7	3.2	0.56	5.2	2.6	0.75	1.8
	0.164	32.6	4.7	3.2	0.52	5.2	2.6	0.75	1.9
	0.221	55.6	4.8	3.3	0.49	5.3	2.7	0.75	1.9
5	0.113	16.1	4.6	3.2	0.62	5.2	2.8	0.77	2.1
	0.164	31.5	4.6	3.2	0.58	5.2	2.9	0.77	2.1
	0.221	53.8	4.7	3.2	0.56	5.2	2.9	0.78	2.2
10	0.113	15.6	4.4	3.1	0.68	5.1	3.1	0.79	2.3
	0.164	30.5	4.5	3.2	0.64	5.2	3.2	0.80	2.4
	0.221	52.1	4.6	3.2	0.62	5.2	3.3	0.80	2.5
15	0.113	15.1	4.3	3.1	0.74	5.0	3.4	0.82	2.6
	0.164	29.5	4.4	3.1	0.70	5.1	3.5	0.83	2.7
	0.221	50.4	4.4	3.1	0.68	5.1	3.6	0.83	2.8
20	0.113	14.7	4.1	3.0	0.80	4.9	3.7	0.85	2.9
	0.164	28.6	4.2	3.1	0.76	5.0	3.9	0.86	3.0
	0.221	48.8	4.3	3.1	0.74	5.0	3.9	0.86	3.1
25	0.113	14.2	3.9	3.0	0.87	4.8	4.1	0.87	3.2
	0.164	27.8	4.0	3.0	0.83	4.9	4.2	0.88	3.3
	0.221	47.4	4.1	3.0	0.80	4.9	4.3	0.89	3.4
30	0.113	13.8	3.7	2.9	0.95	4.6	4.4	0.90	3.5
	0.164	27.0	3.8	2.9	0.90	4.7	4.5	0.90	3.6
	0.221	46.1	3.9	3.0	0.88	4.8	4.6	0.91	3.6
35	0.113	13.5	3.4	2.8	1.04	4.5	Operation Not Recommended		
	0.164	26.3	3.6	2.8	0.99	4.6			
	0.221	45.0	3.7	2.9	0.96	4.6			
40	0.113	13.2	3.2	2.7	1.14	4.3			
	0.164	25.8	3.3	2.7	1.08	4.4			
	0.221	44.0	3.4	2.8	1.05	4.5			
45	0.113	6.9	2.8	2.5	1.26	4.1			
	0.164	19.3	3.0	2.6	1.19	4.2			
	0.221	43.4	3.1	2.7	1.15	4.3			

LEGEND

EWT — Entering Water Temperature (C)
SC — Sensible Capacity
TC — Total Capacity
THA — Total Heat of Absorption
THR — Total Heat of Rejection

NOTES:
1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 27 C db (dry bulb) and 19 C wb (wet bulb) in cooling and 20 C db in heating.
3. All performance data is based upon the lower voltage of dual voltage rated units.
4. Operation below 15 C EWT requires optional insulated water circuit.
5. Operation below 5 C EWT is based upon 15% antifreeze solution.
6. See Correction Factor tables for operating conditions other than those listed above.
7. Table does not reflect fan or pump power ISO corrections.

Performance data (cont)

50RHE019

264 L/S NOMINAL AIRFLOW

EWT (C)	LIQUID FLOW (L/s)	PRESSURE DROP (kPa)	COOLING CAPACITY				HEATING CAPACITY		
			TC (kW)	SC (kW)	Power Input (kW)	THR (kW)	TC (kW)	Power Input (kW)	THA (kW)
–5	0.145	13.1	Operation Not Recommended						
	0.214	23.8					3.3	1.17	2.2
	0.284	46.8					3.3	1.17	2.2
0	0.145	12.7	6.5	4.4	1.09	7.6	3.6	1.20	2.4
	0.214	23.0	6.8	4.6	1.01	7.8	3.7	1.21	2.5
	0.284	45.3	6.9	4.6	0.97	7.9	3.7	1.22	2.5
5	0.145	12.3	6.2	4.3	1.18	7.4	4.0	1.27	2.8
	0.214	22.3	6.5	4.4	1.11	7.6	4.2	1.29	2.9
	0.284	43.8	6.6	4.5	1.07	7.7	4.3	1.31	3.0
10	0.145	11.9	5.9	4.2	1.26	7.2	4.6	1.35	3.3
	0.214	21.6	6.2	4.3	1.19	7.4	4.8	1.38	3.5
	0.284	42.4	6.3	4.3	1.16	7.5	5.0	1.40	3.6
15	0.145	11.5	5.6	4.1	1.34	7.0	5.2	1.44	3.8
	0.214	20.9	5.9	4.1	1.28	7.1	5.5	1.48	4.0
	0.284	41.1	6.0	4.2	1.25	7.2	5.7	1.50	4.1
20	0.145	11.2	5.3	4.0	1.42	6.7	5.9	1.53	4.3
	0.214	20.2	5.5	4.0	1.36	6.9	6.2	1.57	4.6
	0.284	39.8	5.7	4.1	1.33	7.0	6.3	1.60	4.7
25	0.145	10.9	4.9	3.9	1.50	6.4	6.5	1.61	4.8
	0.214	19.6	5.2	3.9	1.44	6.6	6.8	1.65	5.1
	0.284	38.6	5.3	4.0	1.41	6.7	6.9	1.67	5.2
30	0.145	10.6	4.6	3.7	1.58	6.2	7.0	1.68	5.3
	0.214	19.1	4.8	3.8	1.53	6.4	7.2	1.70	5.5
	0.284	37.6	5.0	3.9	1.50	6.5	7.3	1.71	5.6
35	0.145	10.3	4.2	3.5	1.67	5.8	Operation Not Recommended		
	0.214	18.6	4.4	3.7	1.61	6.0			
	0.284	36.6	4.6	3.7	1.58	6.1			
40	0.145	10.1	3.7	3.3	1.76	5.5			
	0.214	18.3	4.0	3.5	1.71	5.7			
	0.284	35.9	4.1	3.5	1.68	5.8			
45	0.145	9.7	3.2	3.0	1.86	5.1			
	0.214	17.9	3.5	3.2	1.81	5.3			
	0.284	35.2	3.6	3.3	1.77	5.4			

LEGEND

EWT — Entering Water Temperature (C)
SC — Sensible Capacity
TC — Total Capacity
THA — Total Heat of Absorption
THR — Total Heat of Rejection

NOTES:

1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 27 C db (dry bulb) and 19 C wb (wet bulb) in cooling and 20 C db in heating.
3. All performance data is based upon the lower voltage of dual voltage rated units.
4. Operation below 15 C EWT requires optional insulated water circuit.
5. Operation below 5 C EWT is based upon 15% antifreeze solution.
6. See Correction Factor tables for operating conditions other than those listed above.
7. Table does not reflect fan or pump power ISO corrections.

50RHE024
307 L/S NOMINAL AIRFLOW

EWT (C)	LIQUID FLOW (L/s)	PRESSURE DROP (kPa)	COOLING CAPACITY				HEATING CAPACITY		
			TC (kW)	SC (kW)	Power Input (kW)	THR (kW)	TC (kW)	Power Input (kW)	THA (kW)
–5	0.189	13.9	Operation Not Recommended						
	0.284	29.5					3.8	1.27	2.6
	0.378	49.2					3.9	1.28	2.6
0	0.189	13.5	7.5	5.3	1.19	8.7	4.3	1.37	3.0
	0.284	28.6	7.8	5.3	1.12	8.9	4.5	1.40	3.1
	0.378	47.7	8.0	5.3	1.08	9.1	4.6	1.41	3.2
5	0.189	13.1	7.1	5.2	1.29	8.4	5.0	1.48	3.5
	0.284	27.7	7.4	5.3	1.22	8.6	5.2	1.51	3.6
	0.378	46.1	7.6	5.3	1.18	8.7	5.3	1.53	3.7
10	0.189	12.6	6.8	5.0	1.38	8.2	5.6	1.58	4.0
	0.284	26.8	7.0	5.1	1.32	8.3	5.8	1.61	4.2
	0.378	44.6	7.2	5.2	1.28	8.4	5.9	1.63	4.3
15	0.189	12.2	6.5	4.8	1.48	7.9	6.2	1.67	4.5
	0.284	25.9	6.7	5.0	1.41	8.1	6.5	1.70	4.8
	0.378	43.2	6.8	5.0	1.38	8.2	6.6	1.72	4.9
20	0.189	11.9	6.1	4.7	1.58	7.7	6.8	1.75	5.1
	0.284	25.1	6.3	4.8	1.51	7.9	7.1	1.78	5.3
	0.378	41.9	6.5	4.8	1.48	7.9	7.2	1.80	5.4
25	0.189	11.5	5.8	4.5	1.68	7.4	7.4	1.82	5.6
	0.284	24.4	6.0	4.6	1.61	7.6	7.7	1.86	5.8
	0.378	40.6	6.1	4.7	1.58	7.7	7.8	1.87	5.9
30	0.189	11.2	5.4	4.3	1.78	7.1	7.9	1.89	6.0
	0.284	23.7	5.6	4.4	1.72	7.3	8.2	1.92	6.3
	0.378	39.5	5.7	4.5	1.68	7.4	8.3	1.94	6.4
35	0.189	11.0	4.9	4.2	1.89	6.8	Operation Not Recommended		
	0.284	23.1	5.2	4.3	1.82	7.0			
	0.378	38.6	5.3	4.3	1.79	7.1			
40	0.189	10.7	4.4	4.0	2.00	6.4			
	0.284	22.6	4.7	4.1	1.94	6.6			
	0.378	37.8	4.8	4.1	1.90	6.7			
45	0.189	22.1	3.8	3.8	2.11	5.9			
	0.284	28.3	4.1	3.9	2.05	6.2			
	0.378	37.2	4.3	3.9	2.02	6.3			

LEGEND

EWT — Entering Water Temperature (C)
SC — Sensible Capacity
TC — Total Capacity
THA — Total Heat of Absorption
THR — Total Heat of Rejection

NOTES:
1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 27 C db (dry bulb) and 19 C wb (wet bulb) in cooling and 20 C db in heating.
3. All performance data is based upon the lower voltage of dual voltage rated units.
4. Operation below 15 C EWT requires optional insulated water circuit.
5. Operation below 5 C EWT is based upon 15% antifreeze solution.
6. See Correction Factor tables for operating conditions other than those listed above.
7. Table does not reflect fan or pump power ISO corrections.

Performance data (cont)

50RHE030

349 L/S NOMINAL AIRFLOW

EWT (C)	LIQUID FLOW (L/s)	PRESSURE DROP (kPa)	COOLING CAPACITY				HEATING CAPACITY		
			TC (kW)	SC (kW)	Power Input (kW)	THR (kW)	TC (kW)	Power Input (kW)	THA (kW)
–5	0.239	10.0	Operation Not Recommended						
	0.347	17.3					4.8	1.56	3.2
	0.473	27.8					4.8	1.57	3.3
0	0.239	9.7	7.9	5.3	1.36	9.2	5.1	1.65	3.4
	0.347	16.8	8.0	5.3	1.30	9.3	5.2	1.68	3.5
	0.473	26.9	8.0	5.3	1.27	9.3	5.3	1.69	3.6
5	0.239	9.4	7.7	5.3	1.46	9.1	5.7	1.75	3.9
	0.347	16.2	7.8	5.3	1.40	9.2	5.8	1.78	4.0
	0.473	26.1	7.9	5.3	1.36	9.2	5.9	1.79	4.1
10	0.239	9.1	7.4	5.3	1.58	9.0	6.3	1.84	4.5
	0.347	15.7	7.6	5.3	1.51	9.1	6.5	1.87	4.7
	0.473	25.2	7.6	5.3	1.47	9.1	6.7	1.88	4.8
15	0.239	8.8	7.1	5.2	1.71	8.8	7.1	1.92	5.1
	0.347	15.2	7.3	5.3	1.64	8.9	7.3	1.95	5.4
	0.473	24.4	7.4	5.3	1.60	9.0	7.5	1.96	5.5
20	0.239	8.5	6.8	5.1	1.84	8.6	7.8	2.00	5.8
	0.347	14.7	7.0	5.2	1.77	8.7	8.0	2.02	6.0
	0.473	23.7	7.1	5.2	1.72	8.8	8.2	2.03	6.2
25	0.239	8.3	6.4	5.0	1.97	8.4	8.4	2.06	6.4
	0.347	14.3	6.6	5.1	1.90	8.5	8.7	2.08	6.6
	0.473	23.0	6.8	5.1	1.86	8.6	8.8	2.10	6.7
30	0.239	8.1	6.0	4.8	2.11	8.1	9.0	2.11	6.8
	0.347	13.9	6.2	4.9	2.04	8.3	9.1	2.14	7.0
	0.473	22.3	6.4	5.0	2.00	8.4	9.2	2.15	7.0
35	0.239	7.9	5.6	4.6	2.25	7.8	Operation Not Recommended		
	0.347	13.6	5.8	4.7	2.18	8.0			
	0.473	21.8	5.9	4.8	2.14	8.1			
40	0.239	7.7	5.1	4.4	2.38	7.5			
	0.347	13.3	5.3	4.5	2.32	7.6			
	0.473	21.3	5.5	4.6	2.28	7.7			
45	0.239	7.6	4.5	4.0	2.51	7.0			
	0.347	13.1	4.8	4.2	2.46	7.2			
	0.473	21.4	4.9	4.3	2.42	7.3			

LEGEND

EWT — Entering Water Temperature (C)
SC — Sensible Capacity
TC — Total Capacity
THA — Total Heat of Absorption
THR — Total Heat of Rejection

NOTES:

1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 27 C db (dry bulb) and 19 C wb (wet bulb) in cooling and 20 C db in heating.
3. All performance data is based upon the lower voltage of dual voltage rated units.
4. Operation below 15 C EWT requires optional insulated water circuit.
5. Operation below 5 C EWT is based upon 15% antifreeze solution.
6. See Correction Factor tables for operating conditions other than those listed above.
7. Table does not reflect fan or pump power ISO corrections.

50RHE036
431 L/S NOMINAL AIRFLOW

EWT (C)	LIQUID FLOW (L/s)	PRESSURE DROP (kPa)	COOLING CAPACITY				HEATING CAPACITY		
			TC (kW)	SC (kW)	Power Input (kW)	THR (kW)	TC (kW)	Power Input (kW)	THA (kW)
–5	0.284	8.0	Operation Not Recommended						
	0.429	15.3					6.0	2.06	3.9
	0.568	24.7					6.1	2.07	4.0
0	0.284	7.8	9.9	6.8	1.81	11.7	6.7	2.14	4.5
	0.429	14.8	10.1	7.0	1.73	11.8	6.9	2.17	4.7
	0.568	23.9	10.2	7.0	1.70	11.9	7.0	2.19	4.8
5	0.284	7.5	9.6	6.7	1.93	11.5	7.6	2.26	5.3
	0.429	14.3	9.8	6.8	1.85	11.6	7.8	2.30	5.5
	0.568	23.1	9.9	6.8	1.81	11.7	8.0	2.33	5.7
10	0.284	7.3	9.3	6.6	2.06	11.3	8.5	2.40	6.1
	0.429	13.8	9.5	6.7	1.97	11.5	8.8	2.45	6.3
	0.568	22.4	9.6	6.7	1.93	11.5	9.0	2.48	6.5
15	0.284	7.1	8.9	6.5	2.20	11.1	9.4	2.55	6.8
	0.429	13.4	9.1	6.5	2.11	11.3	9.7	2.61	7.1
	0.568	21.7	9.3	6.6	2.07	11.3	9.9	2.64	7.3
20	0.284	6.8	8.5	6.4	2.34	10.9	10.3	2.69	7.6
	0.429	13.0	8.8	6.4	2.25	11.0	10.7	2.75	7.9
	0.568	21.0	8.9	6.5	2.21	11.1	10.9	2.78	8.1
25	0.284	6.6	8.1	6.3	2.49	10.6	11.2	2.82	8.4
	0.429	12.6	8.4	6.3	2.40	10.8	11.7	2.88	8.8
	0.568	20.4	8.5	6.4	2.36	10.9	11.9	2.91	9.0
30	0.284	6.5	7.6	6.2	2.64	10.2	12.1	2.94	9.2
	0.429	12.2	7.9	6.2	2.55	10.4	12.6	2.99	9.6
	0.568	19.8	8.0	6.3	2.51	10.5	12.9	3.01	9.9
35	0.284	6.3	7.0	6.0	2.79	9.8	Operation Not Recommended		
	0.429	11.9	7.3	6.1	2.71	10.0			
	0.568	19.4	7.5	6.2	2.66	10.2			
40	0.284	6.2	6.3	5.8	2.95	9.2			
	0.429	11.7	6.7	6.0	2.86	9.5			
	0.568	19.0	6.9	6.0	2.82	9.7			
45	0.284	6.2	5.5	5.5	3.10	8.6			
	0.429	11.7	5.9	5.7	3.02	9.0			
	0.568	18.6	6.1	5.8	2.98	9.1			

LEGEND

EWT — Entering Water Temperature (C)
SC — Sensible Capacity
TC — Total Capacity
THA — Total Heat of Absorption
THR — Total Heat of Rejection

NOTES:
1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 27 C db (dry bulb) and 19 C wb (wet bulb) in cooling and 20 C db in heating.
3. All performance data is based upon the lower voltage of dual voltage rated units.
4. Operation below 15 C EWT requires optional insulated water circuit.
5. Operation below 5 C EWT is based upon 15% antifreeze solution.
6. See Correction Factor tables for operating conditions other than those listed above.
7. Table does not reflect fan or pump power ISO corrections.

Performance data (cont)

50RHE042

530 L/S NOMINAL AIRFLOW

EWT (C)	LIQUID FLOW (L/s)	PRESSURE DROP (kPa)	COOLING CAPACITY				HEATING CAPACITY		
			TC (kW)	SC (kW)	Power Input (kW)	THR (kW)	TC (kW)	Power Input (kW)	THA (kW)
–5	0.334	10.2	Operation Not Recommended						
	0.498	20.3					6.8	2.06	4.8
	0.662	32.2					6.9	2.09	4.8
0	0.334	9.8	11.8	8.2	1.80	13.6	7.5	2.19	5.3
	0.498	19.6	11.9	8.2	1.75	13.7	7.7	2.22	5.5
	0.662	31.1	12.0	8.3	1.69	13.7	7.8	2.25	5.6
5	0.334	9.5	12.2	8.6	1.96	14.2	8.4	2.33	6.1
	0.498	19.0	12.3	8.6	1.90	14.2	8.6	2.36	6.3
	0.662	30.1	12.5	8.7	1.84	14.3	8.9	2.40	6.5
10	0.334	9.2	12.2	8.8	2.14	14.3	9.4	2.46	6.9
	0.498	18.4	12.3	8.8	2.07	14.4	9.6	2.49	7.1
	0.662	29.2	12.5	8.9	2.00	14.5	9.9	2.54	7.4
15	0.334	8.9	11.9	8.8	2.31	14.2	10.3	2.57	7.7
	0.498	17.8	12.0	8.8	2.24	14.2	10.6	2.61	8.0
	0.662	28.2	12.1	8.9	2.17	14.3	10.9	2.65	8.2
20	0.334	8.7	11.3	8.6	2.50	13.8	11.1	2.66	8.5
	0.498	17.2	11.4	8.7	2.42	13.8	11.4	2.70	8.7
	0.662	27.4	11.5	8.7	2.34	13.9	11.7	2.76	9.0
25	0.334	8.4	10.5	8.3	2.69	13.2	11.8	2.73	9.1
	0.498	16.7	10.6	8.4	2.60	13.2	12.1	2.77	9.4
	0.662	26.6	10.7	8.4	2.51	13.2	12.5	2.84	9.6
30	0.334	8.2	9.6	8.0	2.88	12.5	12.3	2.78	9.5
	0.498	16.3	9.7	8.1	2.78	12.5	12.6	2.82	9.8
	0.662	25.9	9.8	8.1	2.68	12.5	13.0	2.90	10.1
35	0.334	8.0	8.7	7.7	3.07	11.8	Operation Not Recommended		
	0.498	15.9	8.8	7.7	2.96	11.8			
	0.662	25.2	8.9	7.8	2.86	11.8			
40	0.334	7.8	7.9	7.4	3.26	11.2			
	0.498	15.6	8.0	7.4	3.15	11.1			
	0.662	24.7	8.1	7.4	3.03	11.1			
45	0.334	6.2	7.2	7.1	3.45	10.7			
	0.498	11.7	7.3	7.2	3.32	10.6			
	0.662	18.6	7.4	7.2	3.20	10.6			

LEGEND

EWT — Entering Water Temperature (C)
SC — Sensible Capacity
TC — Total Capacity
THA — Total Heat of Absorption
THR — Total Heat of Rejection

NOTES:

1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 27 C db (dry bulb) and 19 C wb (wet bulb) in cooling and 20 C db in heating.
3. All performance data is based upon the lower voltage of dual voltage rated units.
4. Operation below 15 C EWT requires optional insulated water circuit.
5. Operation below 5 C EWT is based upon 15% antifreeze solution.
6. See Correction Factor tables for operating conditions other than those listed above.
7. Table does not reflect fan or pump power ISO corrections.

50RHE048

630 L/S NOMINAL AIRFLOW

EWT (C)	LIQUID FLOW (L/s)	PRESSURE DROP	COOLING CAPACITY				HEATING CAPACITY		
		(kPa)	TC (kW)	SC (kW)	Power Input (kW)	THR (kW)	TC (kW)	Power Input (kW)	THA (kW)
–5	0.378	14.5	Operation Not Recommended						
	0.567	27.8					7.1	2.28	4.9
	0.756	45.1					7.3	2.31	5.0
0	0.378	14.1	13.7	9.7	2.10	15.8	8.2	2.50	5.7
	0.567	26.9	13.9	9.7	1.93	15.8	8.5	2.57	5.9
	0.756	43.7	13.9	9.8	1.83	15.8	8.7	2.61	6.1
5	0.378	13.6	13.5	9.6	2.32	15.8	9.6	2.78	6.8
	0.567	26.1	13.7	9.7	2.18	15.8	10.0	2.86	7.1
	0.756	42.3	13.7	9.7	2.10	15.8	10.2	2.90	7.3
10	0.378	13.2	13.1	9.5	2.52	15.6	11.0	3.04	8.0
	0.567	25.2	13.4	9.6	2.39	15.7	11.5	3.13	8.4
	0.756	40.9	13.5	9.6	2.32	15.8	11.8	3.18	8.6
15	0.378	12.7	12.6	9.4	2.71	15.4	12.4	3.29	9.2
	0.567	24.4	13.0	9.4	2.59	15.5	13.0	3.38	9.6
	0.756	39.6	13.1	9.5	2.52	15.6	13.3	3.43	9.9
20	0.378	12.3	12.1	9.2	2.92	15.0	13.8	3.51	10.3
	0.567	23.7	12.5	9.3	2.78	15.3	14.4	3.60	10.8
	0.756	38.4	12.6	9.4	2.72	15.4	14.7	3.65	11.0
25	0.378	12.0	11.5	9.0	3.14	14.6	15.1	3.71	11.4
	0.567	23.0	11.9	9.2	3.00	14.9	15.6	3.79	11.8
	0.756	37.3	12.1	9.2	2.93	15.0	15.9	3.84	12.0
30	0.378	11.7	10.8	8.8	3.40	14.2	16.1	3.87	12.2
	0.567	22.3	11.2	9.0	3.24	14.5	16.6	3.94	12.6
	0.756	36.2	11.4	9.0	3.16	14.6	16.7	3.98	12.8
35	0.378	11.4	10.0	8.6	3.72	13.7	Operation Not Recommended		
	0.567	21.8	10.5	8.7	3.53	14.0			
	0.756	35.4	10.7	8.8	3.44	14.2			
40	0.378	11.1	9.2	8.2	4.10	13.3			
	0.567	21.3	9.7	8.4	3.88	13.5			
	0.756	34.6	9.9	8.5	3.77	13.7			
45	0.378	6.2	8.2	7.8	4.57	12.8			
	0.567	11.7	8.7	8.0	4.30	13.0			
	0.756	18.6	9.0	8.2	4.17	13.2			

LEGEND

EWT — Entering Water Temperature (C)
SC — Sensible Capacity
TC — Total Capacity
THA — Total Heat of Absorption
THR — Total Heat of Rejection

NOTES:

1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 27 C db (dry bulb) and 19 C wb (wet bulb) in cooling and 20 C db in heating.
3. All performance data is based upon the lower voltage of dual voltage rated units.
4. Operation below 15 C EWT requires optional insulated water circuit.
5. Operation below 5 C EWT is based upon 15% antifreeze solution.
6. See Correction Factor tables for operating conditions other than those listed above.
7. Table does not reflect fan or pump power ISO corrections.

Performance data (cont)

50RHE060

790 L/S NOMINAL AIRFLOW

EWT (C)	LIQUID FLOW (L/s)	PRESSURE DROP (kPa)	COOLING CAPACITY				HEATING CAPACITY		
			TC (kW)	SC (kW)	Power Input (kW)	THR (kW)	TC (kW)	Power Input (kW)	THA (kW)
–5	0.473	20.7	Operation Not Recommended						
	0.713	40.4					10.4	3.23	7.2
	0.946	66.4					10.5	3.25	7.3
0	0.473	20.0	16.7	11.4	2.56	19.3	11.0	3.37	7.7
	0.713	39.1	16.8	11.4	2.46	19.3	11.3	3.42	7.9
	0.946	64.3	16.9	11.5	2.42	19.3	11.4	3.44	8.0
5	0.473	19.4	16.4	11.2	2.75	19.2	12.1	3.53	8.6
	0.713	37.8	16.6	11.3	2.63	19.3	12.5	3.58	9.0
	0.946	62.2	16.7	11.4	2.57	19.3	12.7	3.60	9.1
10	0.473	18.7	15.9	11.0	2.98	18.9	13.5	3.68	9.8
	0.713	36.6	16.3	11.1	2.83	19.1	14.0	3.72	10.2
	0.946	60.2	16.4	11.2	2.76	19.2	14.2	3.74	10.5
15	0.473	18.1	15.3	10.7	3.25	18.6	14.9	3.80	11.1
	0.713	35.5	15.7	10.9	3.08	18.8	15.5	3.85	11.6
	0.946	58.3	15.9	11.0	3.00	18.9	15.8	3.87	11.9
20	0.473	17.6	14.6	10.5	3.56	18.2	16.3	3.91	12.4
	0.713	34.4	15.1	10.6	3.36	18.4	16.9	3.95	13.0
	0.946	56.5	15.3	10.7	3.27	18.6	17.2	3.97	13.2
25	0.473	17.1	13.9	10.2	3.91	17.8	17.6	4.00	13.6
	0.713	33.4	14.3	10.4	3.69	18.0	18.2	4.04	14.1
	0.946	54.8	14.6	10.4	3.59	18.1	18.4	4.06	14.4
30	0.473	16.6	13.1	10.0	4.29	17.3	18.7	4.08	14.6
	0.713	32.5	13.5	10.1	4.06	17.6	19.1	4.12	15.0
	0.946	53.3	13.8	10.2	3.94	17.7	19.2	4.13	15.1
35	0.473	16.2	12.3	9.7	4.72	17.0	Operation Not Recommended		
	0.713	31.7	12.7	9.9	4.47	17.2			
	0.946	52.0	13.0	9.9	4.34	17.3			
40	0.473	15.9	11.5	9.6	5.19	16.7			
	0.713	31.1	11.9	9.7	4.92	16.8			
	0.946	51.0	12.1	9.7	4.79	16.9			
45	0.473	15.6	10.8	9.5	5.71	16.5			
	0.713	30.5	11.2	9.5	5.41	16.6			
	0.946	50.1	11.4	9.6	5.27	16.6			

LEGEND

EWT — Entering Water Temperature (C)
SC — Sensible Capacity
TC — Total Capacity
THA — Total Heat of Absorption
THR — Total Heat of Rejection

NOTES:

1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 27 C db (dry bulb) and 19 C wb (wet bulb) in cooling and 20 C db in heating.
3. All performance data is based upon the lower voltage of dual voltage rated units.
4. Operation below 15 C EWT requires optional insulated water circuit.
5. Operation below 5 C EWT is based upon 15% antifreeze solution.
6. See Correction Factor tables for operating conditions other than those listed above.
7. Table does not reflect fan or pump power ISO corrections.

CORRECTION FACTORS — AIRFLOW — 50RHE UNITS

% OF NOMINAL AIRFLOW	HEATING			COOLING			
	TC (kW)	Input Power (kW)	THA (kW)	TC (kW)	SC (kW)	Input Power (kW)	THR (kW)
75%	0.971	1.045	0.956	0.954	0.863	0.961	0.954
81%	0.979	1.029	0.969	0.966	0.897	0.971	0.967
88%	0.988	1.015	0.982	0.980	0.937	0.982	0.980
94%	0.994	1.007	0.992	0.992	0.968	0.990	0.992
100%	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
106%	1.005	0.995	1.007	1.007	1.031	1.009	1.007
113%	1.011	0.992	1.012	1.015	1.065	1.019	1.016

CORRECTION FACTORS — ENTERING AIR — 50RHE UNITS

HEATING				COOLING										
EAT. DB (C)	TC (kW)	Power Input (kW)	THA (kW)	EAT WB (C)	TC (kW)	Sensible Capacity Entering Dry Bulb (C)							Power Input (kW)	THR (kW)
						21	23	25	27	29.5	32	35		
15	1.002	0.989	1.008	**15**	0.910	0.864	1.007	1.132	1.200	*	*	*	0.984	0.923
17	1.001	0.993	1.005	**17**	0.956	0.718	0.858	1.002	1.142	1.264	*	*	0.992	0.963
20	**1.000**	**1.000**	**1.000**	**19**	**1.000**	0.575	0.715	0.856	**1.000**	1.176	*	*	**1.000**	**1.000**
22	0.999	1.012	0.997	**21**	1.073	—	0.570	0.710	0.851	1.031	1.208	1.391	1.011	1.063
24	0.997	1.014	0.988	**23**	1.128	—	—	0.563	0.704	0.878	1.059	1.274	1.019	1.110
26	0.995	1.018	0.988	**25**	1.192	—	—	—	0.554	0.730	0.907	1.127	1.026	1.164

LEGEND

DB — Dry Bulb
EAT — Entering-Air Temperature (C)
kW — Total Power Input (kilowatts)
SC — Sensible Capacity
TC — Total Capacity
THA — Total Heat of Absorption
THR — Total Heat of Rejection
WB — Wet Bulb

*Sensible capacity equals total capacity.

Performance data (cont)

50RHE BLOWER PERFORMANCE

50RHE UNIT	NOMINAL AIRFLOW (L/s)	MINIMUM AIRFLOW (L/s)	FAN SPEED	AIRFLOW (L/s) External Static Pressure (Pa)					
				0	25	50	75	100	125
006	81	61	HI	133	123	112	89	78	—
			MED	110	99	87	68	—	—
			LO	98	90	75	60	—	—
009	113	85	HI	165	151	142	118	99	—
			MED	160	146	127	113	94	—
			LO	151	137	123	109	90	—
012	140	104	HI	170	165	151	137	123	109
			MED	165	151	142	127	118	—
			LO	146	137	127	118	104	—
015	212	160	HI	345	316	288	250	198	—
			MED	321	302	274	241	189	—
			LO	293	278	255	222	179	—
019	264	198	HI	326	311	283	250	203	—
			MED	302	288	260	227	189	—
			LO	293	269	245	217	179	—
024	307	231	HI	396	368	335	302	260	—
			MED	387	359	326	297	255	—
			LO	368	340	311	278	231	—
030	349	264	HI	529	496	463	425	378	330
			MED	510	477	448	415	368	326
			LO	458	439	406	378	340	297
036	437	326	HI	614	576	579	463	415	373
			MED	580	543	488	434	392	349
			LO	505	472	429	387	349	—
042	530	396	HI	743	691	629	566	501	435
			MED	637	593	539	485	429	—
			LO	498	463	421	—	—	—
048	630	472	HI	793	738	672	604	535	464
			MED	777	723	658	592	524	455
			LO	762	709	645	580	514	446
High Static 048	630	472	HI	—	—	—	757	668	552
			MED	—	—	787	710	623	529
			LO	—	797	748	690	612	516
060	790	595	HI	896	866	833	796	755	710
			MED	818	803	779	747	707	658
			LO	748	731	709	683	653	618

LEGEND

Shaded areas are below minimum airflow. This data is provided for troubleshooting information only.

NOTES:
1. Units factory shipped on medium speed. Other speeds require field selection.
2. For dual voltage units, airflow is rated at lowest voltage.
3. Performance data shown is based on wet coil and clean air filter.

50RHE UNITS
RADIATED SOUND POWER DATA

UNIT 50RHE	MODE	SPEED	DUCTED DISCHARGE Octave Band Frequency, Hz							FREE AIR INLET COMBINED WITH RADIATED CABINET Octave Band Frequency, Hz						
			125	250	500	1000	2000	4000	8000	125	250	500	1000	2000	4000	8000
006	FAN ONLY	LOW	62.5	59.0	57.0	58.5	54.5	52.0	49.5	60.5	58.0	52.8	47.0	42.0	35.5	37.0
		HIGH	63.0	62.0	59.0	61.0	57.5	54.5	42.5	60.0	59.5	55.0	49.5	44.5	39.5	38.0
	COOLING	LOW	62.5	60.0	58.0	59.5	55.5	53.0	49.5	61.0	57.5	53.0	47.5	43.0	37.5	36.0
		HIGH	62.8	61.5	59.0	60.8	57.0	54.3	46.0	60.7	58.4	54.3	49.0	44.5	39.9	36.6
	HEATING	LOW	65.5	62.5	59.2	60.7	56.2	53.7	50.5	64.0	60.0	54.3	48.7	43.7	38.2	37.0
		HIGH	65.8	64.0	60.2	62.0	57.7	55.0	47.0	63.7	60.9	55.6	50.2	45.2	40.6	37.6
009	FAN ONLY	LOW	63.0	59.5	57.5	59.0	55.0	52.5	50.0	61.5	58.5	53.5	47.5	42.5	37.0	38.0
		HIGH	63.5	62.5	59.5	62.0	58.0	55.5	54.0	61.5	60.5	56.0	50.0	45.0	40.5	39.0
	COOLING	LOW	63.0	61.0	59.0	60.0	56.5	53.5	50.5	62.5	59.0	54.5	49.0	43.0	38.0	38.0
		HIGH	63.3	62.5	60.0	61.5	58.0	55.0	52.5	62.5	60.0	55.8	50.3	44.3	39.8	38.5
	HEATING	LOW	66.0	63.5	60.2	61.2	57.2	54.2	51.5	65.5	61.5	56.0	50.2	43.7	38.7	39.0
		HIGH	66.3	65.0	61.2	62.7	58.7	55.7	53.5	65.5	62.5	57.3	51.5	45.0	40.5	39.5
012	FAN ONLY	LOW	63.5	60.5	58.5	60.0	56.0	53.0	51.5	62.5	59.5	54.0	48.5	44.0	38.0	39.0
		HIGH	66.5	63.5	60.5	62.5	58.0	57.0	61.5	63.0	62.0	56.0	51.0	46.5	42.0	40.0
	COOLING	LOW	64.0	62.0	60.0	60.5	57.0	54.0	51.0	64.0	58.0	54.8	49.5	45.0	39.0	39.2
		HIGH	65.5	63.5	61.0	61.8	58.0	56.0	56.0	64.3	59.3	55.8	50.8	46.3	41.0	39.7
	HEATING	LOW	67.0	64.5	61.2	61.7	57.7	54.7	52.0	67.0	60.5	56.0	50.7	45.7	39.7	40.2
		HIGH	68.5	66.0	62.2	63.0	58.7	56.7	57.0	67.3	61.8	57.0	52.0	47.0	41.7	40.7
015	FAN ONLY	LOW	72.5	58.0	59.5	57.5	54.0	52.0	44.5	63.0	55.5	52.5	48.5	45.5	39.0	31.0
		HIGH	65.5	62.0	57.5	63.0	58.5	48.0	38.0	66.0	60.2	55.0	51.5	48.0	43.0	34.3
	COOLING	LOW	72.0	59.5	60.5	58.0	55.0	53.0	45.0	64.5	59.0	57.0	50.5	47.0	40.5	37.0
		HIGH	69.2	61.1	59.7	60.2	56.8	51.4	42.4	65.7	60.9	58.0	51.7	48.0	42.1	38.3
	HEATING	LOW	75.0	62.0	62.3	59.2	55.7	53.7	46.0	67.5	61.5	58.5	51.7	47.7	41.2	38.0
		HIGH	72.2	63.6	61.5	61.4	57.5	52.1	43.4	68.7	63.4	59.5	52.9	48.7	42.8	39.3
019	FAN ONLY	LOW	73.0	58.5	60.5	58.0	55.0	53.0	45.0	64.0	56.5	53.5	49.5	46.5	39.5	31.5
		HIGH	67.0	63.0	64.0	64.0	60.0	58.5	52.0	68.5	61.5	56.0	53.0	49.5	44.5	35.0
	COOLING	LOW	73.0	60.0	61.5	59.0	56.0	53.5	46.0	65.5	59.5	54.0	51.0	48.5	41.5	38.0
		HIGH	70.6	61.8	62.9	61.4	58.0	55.7	48.8	67.3	61.5	55.0	52.4	49.7	43.5	39.4
	HEATING	LOW	76.0	62.5	63.6	60.2	56.7	54.2	47.0	68.5	62.0	55.5	52.2	49.2	42.2	39.0
		HIGH	73.6	64.3	65.0	62.6	58.7	56.4	49.8	70.3	64.0	56.5	53.6	50.4	44.2	40.4
024	FAN ONLY	LOW	74.0	59.5	62.0	59.0	56.0	54.0	46.0	65.0	58.0	54.5	51.0	48.0	41.0	32.5
		HIGH	68.5	64.5	61.0	65.5	61.5	60.0	53.5	70.0	63.5	57.5	55.0	51.5	46.5	36.5
	COOLING	LOW	73.5	61.0	62.5	60.0	57.0	55.0	46.5	68.5	60.8	55.5	53.0	49.5	43.0	39.9
		HIGH	71.3	63.0	62.1	62.6	59.2	57.4	49.5	70.5	63.0	56.7	54.6	50.9	45.2	41.5
	HEATING	LOW	76.5	63.5	61.9	61.2	57.7	55.7	47.5	71.5	63.3	57.3	54.2	50.2	43.7	40.9
		HIGH	74.3	65.5	61.5	63.8	59.9	58.1	50.5	73.5	65.5	58.5	55.8	51.6	45.9	42.5
030	FAN ONLY	LOW	76.5	64.5	68.0	63.5	62.0	62.0	56.5	69.5	61.5	57.5	55.5	53.0	49.5	40.0
		HIGH	72.0	67.5	69.0	69.0	65.5	65.0	60.5	74.5	64.5	59.0	58.5	56.0	54.0	46.0
	COOLING	LOW	81.5	65.0	68.0	64.5	62.5	62.5	57.0	71.5	62.5	57.5	55.5	53.5	49.0	41.0
		HIGH	80.2	65.9	68.3	66.2	63.6	63.4	58.2	73.0	65.2	58.9	58.2	56.2	53.1	46.4
	HEATING	LOW	84.0	66.5	69.0	65.0	62.5	62.0	57.5	74.0	64.0	58.5	56.0	53.5	48.5	41.5
		HIGH	82.7	67.4	69.3	66.7	63.6	62.9	58.7	75.5	66.7	59.9	58.7	56.2	52.6	46.9
036	FAN ONLY	LOW	73.5	65.0	66.5	63.5	61.5	61.0	54.5	69.0	61.0	57.5	55.0	52.5	47.0	39.0
		HIGH	73.0	69.5	69.5	70.5	66.5	66.0	61.5	73.5	67.5	61.5	60.0	56.0	54.0	46.0
	COOLING	LOW	79.5	65.0	67.5	63.0	61.5	60.0	54.5	74.0	64.0	61.0	55.0	51.5	47.0	42.5
		HIGH	79.4	66.4	68.4	65.1	63.0	61.5	56.6	75.4	66.0	62.2	56.5	52.6	49.1	44.6
	HEATING	LOW	82.0	66.5	68.5	63.5	61.5	59.5	55.0	76.5	65.5	62.0	55.5	51.5	46.5	43.0
		HIGH	81.9	67.9	69.4	65.6	63.0	61.0	57.1	77.9	67.5	63.2	57.0	52.6	48.6	45.1
042	FAN ONLY	LOW	64.0	59.0	58.5	56.0	52.0	48.5	40.5	63.0	58.0	55.5	52.0	44.0	37.0	31.0
		HIGH	72.0	72.0	68.5	69.0	65.0	64.5	59.0	74.5	69.0	63.5	62.0	56.5	53.0	46.0
	COOLING	LOW	71.0	62.5	60.5	58.5	55.0	51.0	44.0	80.0	65.5	58.0	54.5	47.5	41.5	41.0
		HIGH	72.6	65.1	62.5	61.1	57.6	54.2	47.7	82.3	69.9	61.2	58.5	52.5	47.9	47.0
	HEATING	LOW	73.5	64.0	61.5	59.0	55.0	50.5	44.5	82.5	67.0	59.0	55.0	47.5	41.0	41.5
		HIGH	75.1	66.6	63.5	61.6	57.6	53.7	48.2	84.8	69.2	60.6	57.0	50.0	44.2	44.5
048	FAN ONLY	LOW	65.0	60.0	59.5	56.5	53.0	49.0	41.5	64.0	59.0	57.0	53.0	45.0	38.0	32.0
		HIGH	73.5	73.0	70.0	70.5	66.5	65.5	60.0	76.0	70.5	65.0	63.5	58.0	55.0	47.5
	COOLING	LOW	72.5	63.0	61.0	59.5	56.0	52.0	45.0	81.0	66.3	59.0	55.3	49.5	44.0	42.5
		HIGH	74.2	65.6	63.1	62.3	58.7	55.3	48.7	83.4	68.6	60.6	57.4	52.1	47.4	45.6
	HEATING	LOW	75.0	64.5	62.0	60.0	56.0	51.5	45.5	83.5	67.8	60.0	55.8	49.5	43.5	43.0
		HIGH	76.7	67.1	64.1	62.8	58.7	54.8	49.2	85.9	70.1	61.6	57.9	52.1	46.9	46.1
060	FAN ONLY	LOW	78.5	74.0	71.5	71.5	69.0	68.5	65.0	79.5	71.0	65.0	62.5	60.0	56.5	49.0
		HIGH	81.0	77.5	74.5	74.5	72.0	72.0	68.5	82.0	74.5	67.5	65.0	63.0	60.0	53.0
	COOLING	LOW	78.5	74.0	71.0	71.0	68.5	68.0	64.5	79.0	71.0	65.0	63.0	59.5	56.5	49.0
		HIGH	79.0	74.7	71.6	71.6	69.1	68.7	65.2	79.5	71.7	65.5	63.5	60.1	57.2	49.8
	HEATING	LOW	81.0	75.5	72.0	71.5	68.5	67.5	65.0	81.5	72.5	66.0	63.5	59.5	56.0	49.5
		HIGH	81.5	76.2	72.6	72.1	69.1	68.2	65.7	82.0	73.2	66.5	64.0	60.1	56.7	50.3

NOTES:
1. Data based on sound measurements made in a reverberant room on representative units from each cabinet size in accordance with ARI Standard 260-2000.
2. Ratings for medium speed can be obtained through interpolation.

Performance data (cont)

50RHE UNITS WITH MUTE PACKAGE OPTION
RADIATED SOUND POWER DATA

UNIT 50RHE	MODE	SPEED	FREE AIR INLET COMBINED WITH RADIATED CABINET						
			Octave Band Frequency, Hz						
			125	250	500	1000	2000	4000	8000
006	FAN ONLY	LOW	60.0	58.5	51.3	45.5	39.0	33.0	37.0
		HIGH	59.5	57.5	52.5	45.5	40.0	34.5	35.0
	COOLING	LOW	59.5	54.5	51.5	45.0	40.0	33.5	31.0
		HIGH	58.7	55.9	53.3	46.0	41.0	36.4	32.1
	HEATING	LOW	62.5	57.0	52.8	46.2	40.7	34.2	32.0
		HIGH	61.7	58.4	54.6	47.2	41.7	37.1	36.6
009	FAN ONLY	LOW	61.0	59.0	52.0	46.0	39.5	34.5	38.0
		HIGH	61.0	58.5	53.5	46.0	40.5	35.5	36.0
	COOLING	LOW	61.0	56.0	53.0	46.5	40.0	34.0	33.0
		HIGH	60.5	57.5	54.8	47.3	40.8	36.3	34.0
	HEATING	LOW	64.0	58.5	54.5	47.7	40.7	34.7	34.0
		HIGH	63.5	60.0	56.3	48.5	41.5	37.0	38.5
012	FAN ONLY	LOW	62.0	60.0	52.5	47.0	41.0	35.5	39.0
		HIGH	62.5	60.0	53.5	47.0	42.0	37.0	37.0
	COOLING	LOW	62.5	55.0	53.3	47.0	42.0	35.0	34.2
		HIGH	62.3	56.8	54.8	47.8	42.8	37.5	35.2
	HEATING	LOW	65.5	57.5	54.5	48.2	42.7	35.7	35.2
		HIGH	65.3	59.3	56.0	49.0	43.5	38.2	39.7
015	FAN ONLY	LOW	62.5	56.0	51.0	47.0	42.5	36.5	31.0
		HIGH	65.5	58.2	52.5	47.5	43.5	38.0	31.3
	COOLING	LOW	63.0	56.0	55.5	48.0	44.0	36.5	32.0
		HIGH	63.7	58.4	57.0	48.7	44.5	38.6	33.8
	HEATING	LOW	66.0	58.5	57.0	49.2	44.7	37.2	33.0
		HIGH	66.7	60.9	58.5	49.9	45.2	39.3	38.3
019	FAN ONLY	LOW	63.5	57.0	52.0	48.0	43.5	37.0	31.5
		HIGH	68.0	59.5	53.5	49.0	45.0	39.5	32.0
	COOLING	LOW	64.0	56.5	52.5	48.5	45.5	37.5	33.0
		HIGH	65.3	59.0	54.0	49.4	46.2	40.0	34.9
	HEATING	LOW	67.0	59.0	54.0	49.7	46.2	38.2	34.0
		HIGH	68.3	61.5	55.5	50.6	46.9	40.7	39.4
024	FAN ONLY	LOW	64.5	58.5	53.0	49.5	45.0	38.5	32.5
		HIGH	69.5	61.5	55.0	51.0	47.0	41.5	33.5
	COOLING	LOW	67.0	57.8	54.0	50.5	46.5	39.0	34.9
		HIGH	68.5	60.5	55.7	51.6	47.4	41.7	37.0
	HEATING	LOW	70.0	60.3	55.8	51.7	47.2	39.7	35.9
		HIGH	71.5	63.0	57.5	52.8	48.1	42.4	41.5

NOTES:
1. Data based on sound measurements made in a reverberant room on representative units from each cabinet size in accordance with ARI Standard 260-2000.
2. Ratings for medium speed can be obtained through interpolation.

50RHE UNITS WITH MUTE PACKAGE OPTION (cont)

RADIATED SOUND POWER DATA (cont)

UNIT 50RHE	MODE	SPEED	FREE AIR INLET COMBINED WITH RADIATED CABINET						
			Octave Band Frequency, Hz						
			125	250	500	1000	2000	4000	8000
030	FAN ONLY	LOW	69.0	62.0	56.0	54.0	50.0	47.0	40.0
		HIGH	74.0	62.5	56.5	54.5	51.5	49.0	43.0
	COOLING	LOW	70.0	59.5	56.0	53.0	50.5	45.0	36.0
		HIGH	71.0	62.7	57.9	55.2	52.7	49.6	41.9
	HEATING	LOW	72.5	61.0	57.0	53.5	50.5	44.5	36.5
		HIGH	73.5	64.2	58.9	55.7	52.7	49.1	45.9
036	FAN ONLY	LOW	68.5	61.5	56.0	53.5	49.5	44.5	39.0
		HIGH	73.0	65.5	59.0	56.0	51.5	49.0	43.0
	COOLING	LOW	72.5	61.0	59.5	52.5	48.5	43.0	37.5
		HIGH	73.4	63.5	61.2	53.5	49.1	45.6	40.1
	HEATING	LOW	75.0	62.5	60.5	53.0	48.5	42.5	38.0
		HIGH	75.9	65.0	62.2	54.0	49.1	45.1	44.1
042	FAN ONLY	LOW	62.5	58.5	54.0	50.5	41.0	34.5	31.0
		HIGH	74.0	67.0	61.0	58.0	52.0	48.0	43.0
	COOLING	LOW	78.5	62.5	56.5	52.0	44.5	37.5	36.0
		HIGH	80.3	67.4	60.2	55.5	49.0	44.4	42.5
	HEATING	LOW	81.0	64.0	57.5	52.5	44.5	37.0	36.5
		HIGH	82.8	66.7	59.6	54.0	46.5	40.7	43.5
048	FAN ONLY	LOW	63.5	59.5	55.5	51.5	42.0	35.5	32.0
		HIGH	75.5	68.5	62.5	59.5	53.5	50.0	44.5
	COOLING	LOW	79.5	63.3	57.5	52.8	46.5	40.0	37.5
		HIGH	81.4	66.1	59.6	54.4	48.6	43.9	41.1
	HEATING	LOW	82.0	64.8	58.5	53.3	46.5	39.5	38.0
		HIGH	83.9	67.6	60.6	54.9	48.6	43.4	45.1
060	FAN ONLY	LOW	79.0	71.5	63.5	61.0	57.0	54.0	49.0
		HIGH	81.5	72.5	65.0	61.0	58.5	55.0	50.0
	COOLING	LOW	77.5	68.0	63.5	60.5	56.5	52.5	44.0
		HIGH	77.5	69.2	64.5	60.5	56.6	53.7	45.3
	HEATING	LOW	80.0	69.5	64.5	61.0	56.5	52.0	44.5
		HIGH	80.0	70.7	65.5	61.0	56.6	53.2	49.3

NOTES:
1. Data based on sound measurements made in a reverberant room on representative units from each cabinet size in accordance with ARI Standard 260-2000.
2. Ratings for medium speed can be obtained through interpolation.

Electrical data

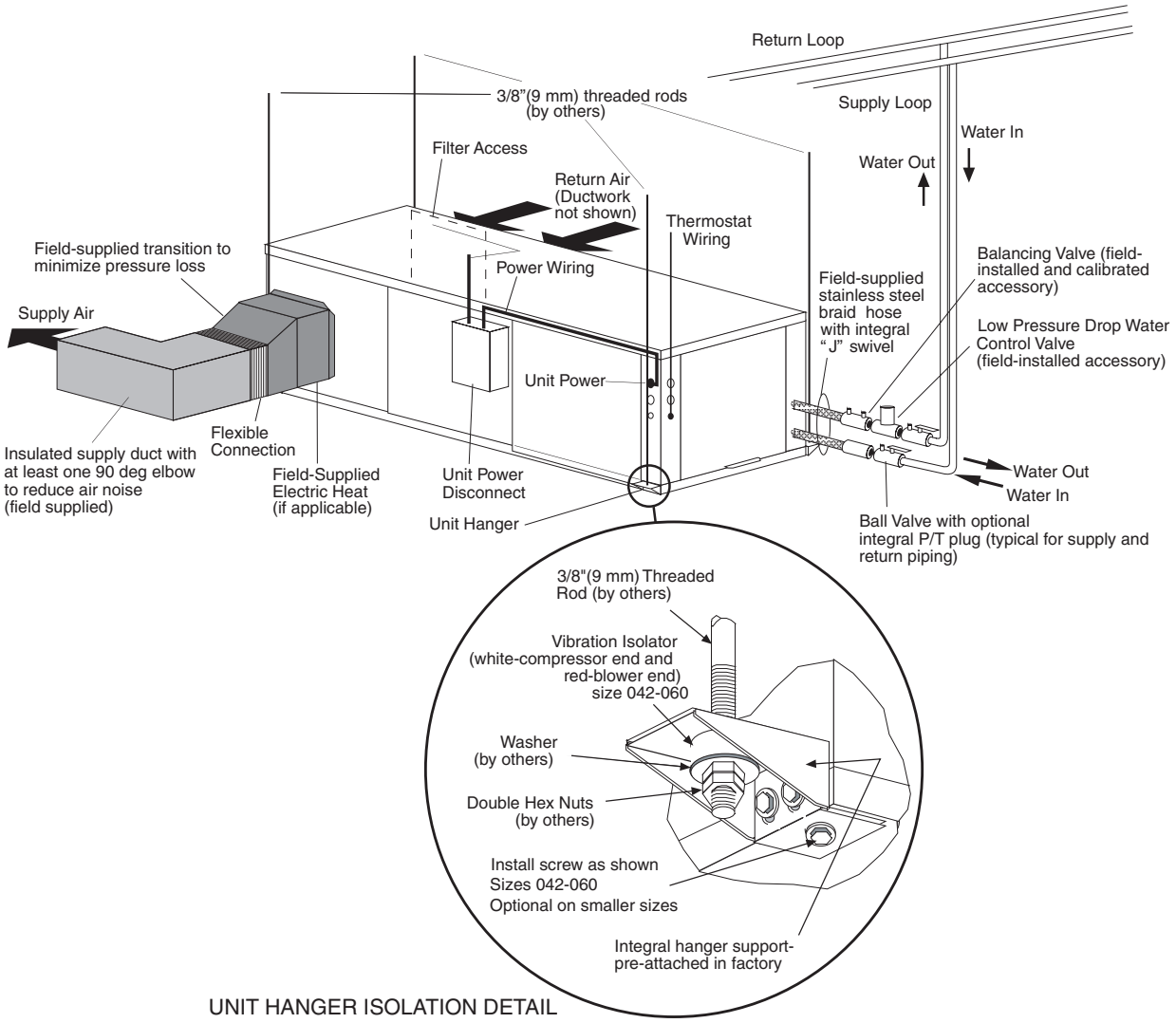
50RHE UNIT	VOLTS-PHASE (50 Hz)	VOLTAGE MIN/MAX	COMPRESSOR		FAN MOTOR FLA	TOTAL UNIT FLA	MIN CIRCUIT AMP	MAX FUSE/HACR
			RLA	LRA				
006	220/240-1	197/254	2.3	15.0	0.4	2.7	3.2	15
009	220/240-1	197/254	2.7	18.8	0.7	3.7	4.5	15
012	220/240-1	197/254	3.9	22.2	0.7	4.5	5.6	15
015	220/240-1	197/254	4.2	27.0	0.9	5.9	7.1	15
019	220/240-1	197/254	6.8	45.0	0.9	8.6	10.5	15
024	220/240-1	197/254	8.2	51.0	1.6	10.4	12.6	20
030	220/240-1	197/254	9.1	54.0	1.7	11.2	13.6	20
	380-415-3	342/462	3.3	25.0	1.0	4.3	5.2	15
036	220/240-1	197/254	11.5	83.0	2.7	17.2	20.8	35
	380-415-3	342/462	4.2	32.0	1.7	5.9	6.0	15
042	380-415-3	342/462	5.5	34.5	1.7	6.0	7.1	15
048	380-415-3	342/462	5.9	42.0	1.8	7.5	8.9	15
060	380-415-3	342/462	8.2	61.8	2.5	9.9	11.8	15

LEGEND

FLA — Full Load Amps
HACR — Heating, Air Conditioning and Refrigeration
LRA — Locked Rotor Amps
RLA — Rated Load Amps

Typical piping and wiring

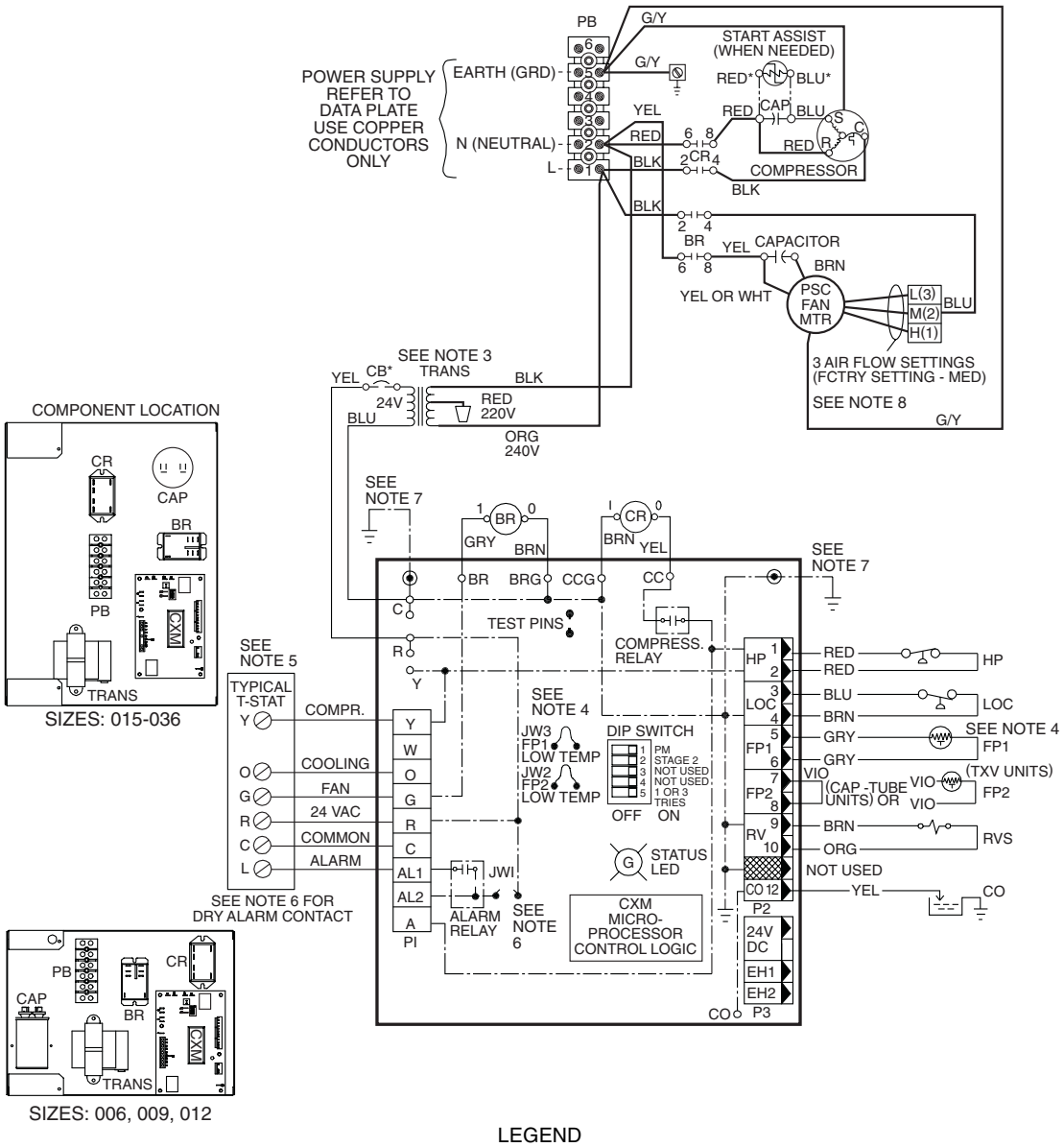
TYPICAL INSTALLATION — 50RHE UNITS


Return Loop
3/8”(9 mm) threaded rods (by others)
Supply Loop
Water In
Water Out
Filter Access
Return Air (Ductwork not shown)
Thermostat Wiring
Power Wiring
Field-supplied transition to minimize pressure loss
Supply Air
Field-supplied stainless steel braid hose with integral “J” swivel
Balancing Valve (field-installed and calibrated accessory)
Low Pressure Drop Water Control Valve (field-installed accessory)
Unit Power
Flexible Connection
Insulated supply duct with at least one 90 deg elbow to reduce air noise (field supplied)
Field-Supplied Electric Heat (if applicable)
Unit Power Disconnect
Unit Hanger
Water Out
Water In
Ball Valve with optional integral P/T plug (typical for supply and return piping)
3/8"(9 mm) Threaded Rod (by others)
Vibration Isolator (white-compressor end and red-blower end) size 042-060
Washer (by others)
Double Hex Nuts (by others)
Install screw as shown Sizes 042-060 Optional on smaller sizes
Integral hanger support-pre-attached in factory

UNIT HANGER ISOLATION DETAIL

Typical wiring schematics

TYPICAL AQUAZONE™ COMPLETE C CONTROL WIRING (SINGLE-PHASE UNITS)



LEGEND

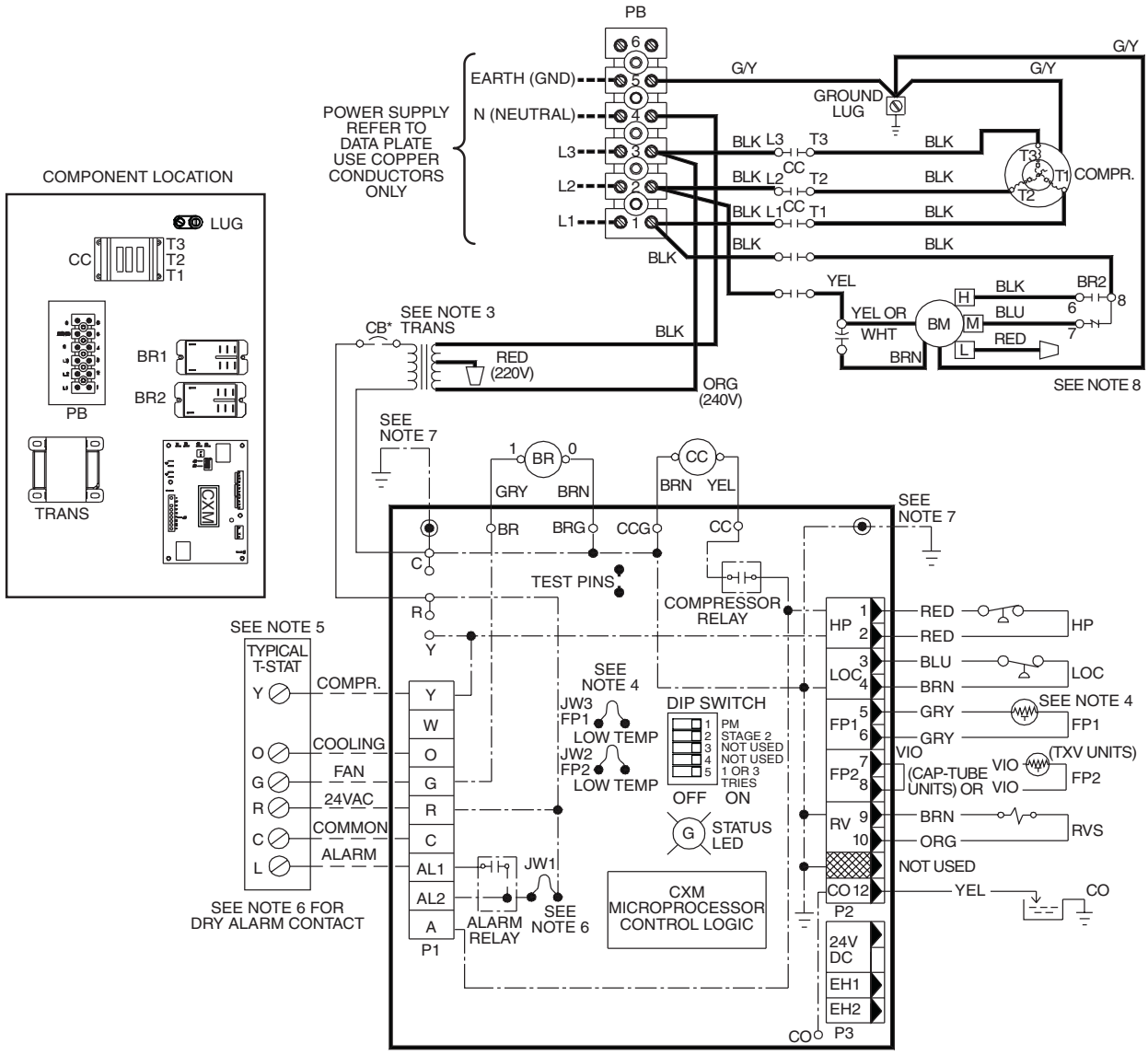
AL — Alarm Relay Contacts
BR — Blower Relay
CAP — Compressor Capacitor
CB — Circuit Breaker
CC — Compressor Contactor
CO — Sensor, Condensate Overflow
FP1 — Sensor, Water Coil Freeze Protection
FP2 — Sensor, Air Coil Freeze Protection
GND — Ground
HP — High-Pressure Switch
JW — Clippable Field Selection Jumper
LOC — Loss of Charge Pressure Switch
P1 — Field Wiring Terminal Block
PM — Performance Monitor
PSC — Permanent Split Capacitor
RVS — Reversing Valve Solenoid
TRANS — Transformer
TXV — Thermostatic Expansion Valve

Field Line Voltage Wiring
Field Low Voltage Wiring
Printed Circuit Trace
Optional Wiring
Relay/Contactor Coil
Thermistor
Condensate Pan
Circuit Breaker
Relay Contacts — N.C.
Solenoid Coil
Relay Contacts — N.O.
Switch Temperature
Switch Low Pressure
Ground
Wire Nut

*Optional Wiring.

NOTES:
1. Compressor and blower motor thermally protected internally.
2. All wiring to the unit must comply with NEC and local codes.
3. Transformer is wired to 240 v (ORG) lead for 240/50/1 units, switch RED and ORG leads to PB(1) and insulate ORG lead.
4. FP1 thermistor provides freeze protection for water. When using antifreeze solutions, cut JW3 jumper.
5. Typical heat pump thermostat wiring shown. Refer to thermostat installation instructions for wiring to the unit.
6. 24-v alarm signal shown. For dry alarm contact, cut JW1 jumper. Dry contact will be available between AL1 and AL2.
7. Transformer secondary ground via microprocessor board stand-offs and screws to control box. (Ground available from top two standoffs as shown.)
8. Fan motors factory wired for medium speed. For high or low speed remove BLU wire from fan motor speed tap “M” and connect to “H” for high or “L” for low.

TYPICAL AQUAZONE™ COMPLETE C CONTROL WIRING (3-PHASE UNITS)



LEGEND

AL	— Alarm Relay Contacts	**PSC**	— Permanent Split Capacitor
BR	— Blower Relay	**RVS**	— Reversing Valve Solenoid
CAP	— Compressor Capacitor	**TRANS**	— Transformer
CB	— Circuit Breaker	**TXV**	— Thermostatic Expansion Valve
CC	— Compressor Contactor		Field Line Voltage Wiring
CO	— Sensor, Condensate Overflow		Field Low Voltage Wiring
COMPR	— Compressor		Printed Circuit Trace
FP1	— Sensor, Water Coil Freeze Protection		Optional Wiring
FP2	— Sensor, Air Coil Freeze Protection		Relay/Contactor Coil
GND	— Ground		Thermistor
HP	— High-Pressure Switch		Condensate Pan
JW	— Clippable Field Selection Jumper		
LOC	— Loss of Charge Pressure Switch		
P1	— Field Wiring Terminal Block		
PM	— Performance Monitor		

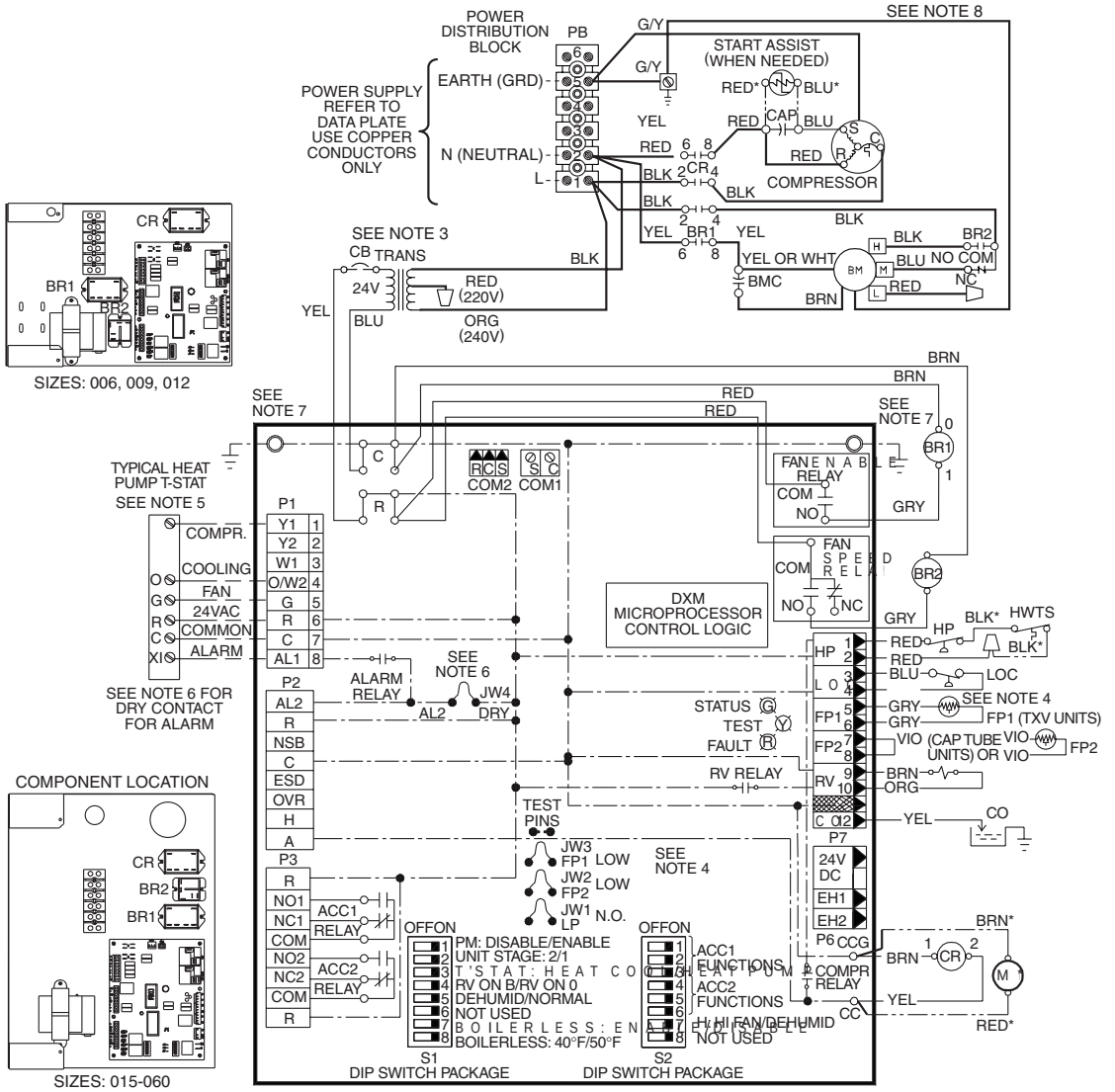
	Circuit Breaker
	Relay Contacts — N.C.
	Solenoid Coil
	Relay Contacts — N.O.
	Switch Temperature
	Switch Low Pressure
	Ground
	Wire Nut
	Splice Cap

*Optional wiring.

NOTES:
1. Compressor and blower motor thermally protected internally.
2. All wiring to the unit must comply with NEC and local codes.
3. Transformer is wired to 240 v (ORG) lead for 240/50/1 units, switch RED and ORG leads to PB(1) and insulate ORG lead.
4. FP1 thermistor provides freeze protection for water. When using antifreeze solutions, cut JW3 jumper.
5. Typical heat pump thermostat wiring shown. Refer to thermostat installation instructions for wiring to the unit.
6. 24-v alarm signal shown. For dry alarm contact, cut JW1 jumper. Dry contact will be available between AL1 and AL2.
7. Transformer secondary ground via microprocessor board standoffs and screws to control box. (Ground available from top two standoffs as shown.)
8. Fan motors factory wired for medium speed. For high or low speed remove BLU wire from fan motor speed tap “M” and connect to “H” for high or “L” for low.

Typical wiring schematics (cont)

TYPICAL AQUAZONE™ DELUXE D CONTROL WIRING (SINGLE-PHASE UNITS)



LEGEND

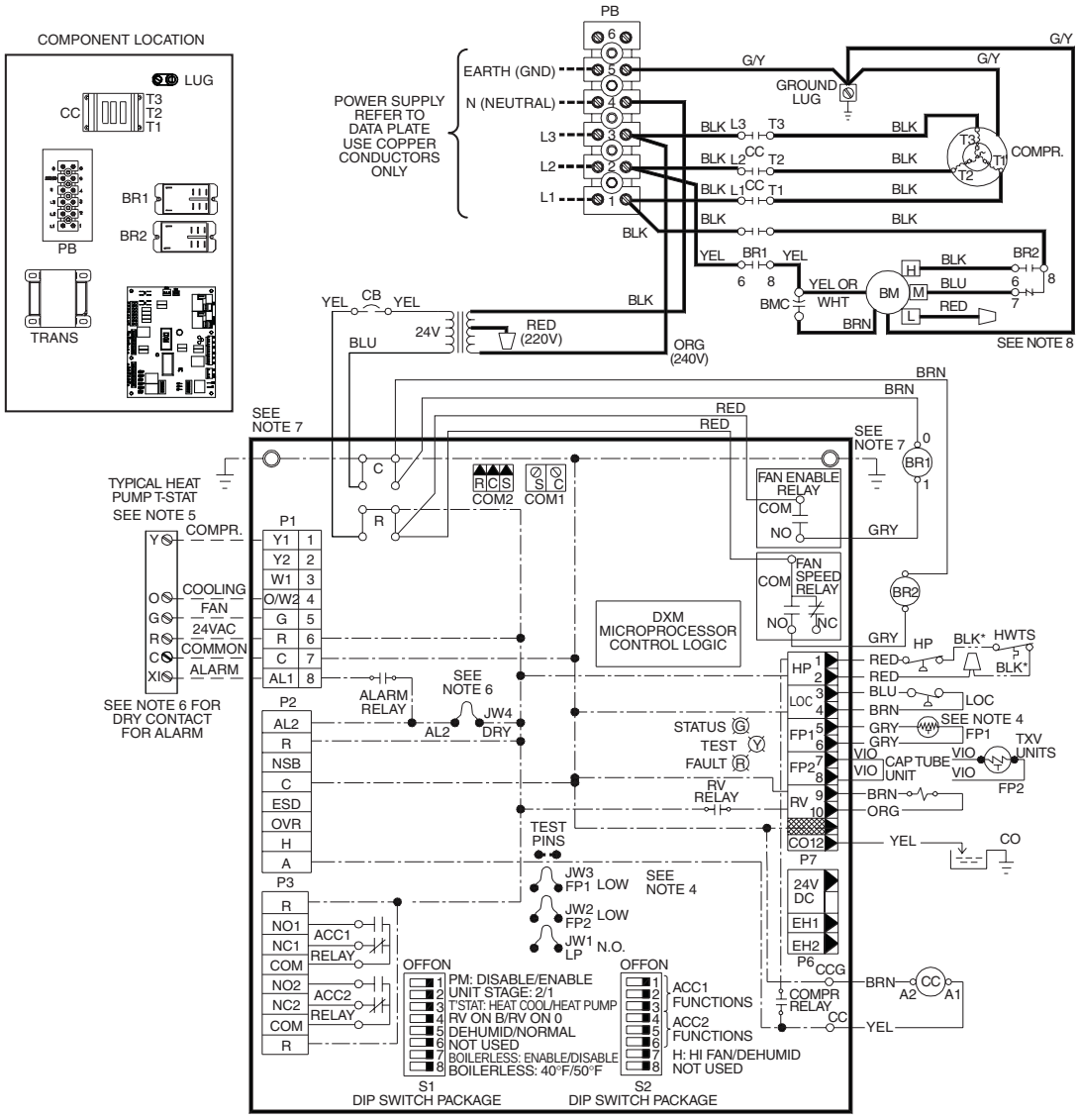
AL — Alarm Relay Contacts
BM — Blower Motor
BMC — Blower Motor Capacitor
BR — Blower Relay
CAP — Compressor Capacitor
CB — Circuit Breaker
CCH — Crankcase Heater
CO — Sensor, Condensate Overflow
FP1 — Sensor, Water Coil Freeze Protection
FP2 — Sensor, Air Coil Freeze Protection
GND — Ground
HP — High-Pressure Switch
HWTS — High (Leaving) Water Temp Switch
JW — Clippable Field Selection Jumper
LOC — Loss of Charge Pressure Switch
*Optional wiring.

MV — Motorized Valve
P1 — Field Wiring Terminal Block
PM — Performance Monitor
PSC — Permanent Split Capacitor
RVS — Reversing Valve Solenoid
TRANS — Transformer
TXV — Thermostatic Expansion Valve
Field Line Voltage Wiring
Field Low Voltage Wiring
Printed Circuit Trace
Optional Wiring
Relay/Contactor Coil

Thermistor
Condensate Pan
LED
Solenoid Coil
Relay Contacts — N.O.
Temperature Switch
Switch — Loss of Charge
Ground
Wire Nut

NOTES:
1. Compressor and blower motor thermally protected internally.
2. All wiring to the unit must comply with NEC and local codes.
3. Transformer is wired to 240 v (ORG) lead for 240/50/1 units, switch RED and ORG leads to PB(1) and insulate ORG lead for 220/50/1.
4. FP1 thermistor provides freeze protection for water. When using antifreeze solutions, cut JW3 jumper.
5. Check installation wiring information for specific thermostat hookup. Refer to thermostat installation instructions for wiring to the unit. Thermostat wiring must be “Class 1” and voltage rating equal to or greater than unit supply voltage.
6. 24-v alarm signal shown. For dry alarm contact, cut JW4 jumper, and dry contact will be available between AL1 and AL2.
7. Transformer secondary ground via microprocessor board stand-offs and screws to control box. (Ground available from top two standoffs as shown.)
8. Blower motor is factory wired for medium and high speeds. For any other combination of speeds, at the motor attach black wire to the higher of the two desired speed taps, and the blue wire to the lower of the two desired speed taps.

TYPICAL AQUAZONE™ DELUXE D CONTROL WIRING (3-PHASE UNITS)



LEGEND

AL	— Alarm Relay Contacts	
BM	— Blower Motor	
BMC	— Blower Motor Capacitor	
BR	— Blower Relay	
CAP	— Compressor Capacitor	
CB	— Circuit Breaker	
CCH	— Crankcase Heater	
CO	— Sensor, Condensate Overflow	
FP1	— Sensor, Water Coil Freeze Protection	
FP2	— Sensor, Air Coil Freeze Protection	
GND	— Ground	
HP	— High-Pressure Switch	
HWTS	— High (Leaving) Water Temp Switch	
JW	— Clippable Field Selection Jumper	
LOC	— Loss of Charge Pressure Switch	
MV	— Motorized Valve	
P1	— Field Wiring Terminal Block	
PM	— Performance Monitor	
PSC	— Permanent Split Capacitor	
RVS	— Reversing Valve Solenoid	
TRANS	— Transformer	
TXV	— Thermostatic Expansion Valve	

*Optional wiring.

Field Line Voltage Wiring
Field Low Voltage Wiring
Printed Circuit Trace
Optional Wiring
Relay/Contactor Coil
Thermistor

Condensate Pan
Circuit Breaker
LED
Capacitor
Solenoid Coil
Relay Contacts — N.O.
Temperature Switch
Switch — Loss of Charge
Ground
Wire Nut

NOTES:
1. Compressor and blower motor thermally protected internally.
2. All wiring to the unit must comply with NEC and local codes.
3. Neural of 380/415-3-50 is required. Transformer is wired to 240-v (ORG) lead for 415/3/50. For 380/3/50 switch ORG and (RED) leads at PB(1) and insulate ORG lead. Transformer uses separate circuit breaker.
4. FP1 thermistor provides freeze protection for water. When using antifreeze solutions, cut JW3 jumper.
5. Check installation wiring information for specific thermostat hookup. Refer to thermostat installation instructions for wiring to the unit. Thermostat wiring must be "Class 1" and voltage rating equal to or greater than unit supply voltage.
6. 24-v alarm signal shown. For dry alarm contact, cut JW4 jumper, and dry contact will be available between AL1 and AL2.
7. Transformer secondary ground via microprocessor board standoffs and screws to control box. (Ground available from top two standoffs as shown.)
8. Blower motor is factory wired for medium and high speeds. For any other combination of speeds, at the motor attach black wire to the higher of the two desired speed taps, and the blue wire to the lower of the two desired speed taps.
9. Blower motor is factory wired for high and low speeds. No other combination of speeds is available.

Application data

Water loop system

Water loop (or boiler/tower) system applications typically include a number of units plumbed to a common piping system. For optimal performance, this system should be designed between 0.040 and 0.054 l/s per kW of cooling capacity. The system is comprised of highly efficient packaged reverse cycle heat pump units interconnected by a water loop. The water circuit serves as both a sink and source for heat absorption and rejection and is designed for entering water temperatures between 15.6 C and 35 C. Within this temperature range units can heat or cool, as required, from the same water source. Transferring heat from warm to cold spaces in the building reduces the need to create heat and conserves energy.

Refer to the **Carrier Water Source Heat Pump System Design Guide** for assistance with the design of water loop systems. The guide includes a practical approach for the latest and most current design recommendations including:

- Product applications.
- Ventilation methods and system design including energy recovery.
- Acoustical considerations for different product types.
- Addressing IAQ issues such as condensate removal and humidity control.
- Air Distribution Design including diffuser selection/layout and ductwork design.
- Hydronic System Design including pipe sizing/layout and boiler/tower sizing.
- Control Configurations such as stand alone, DDC, DCV, and VVT®.
- WSHP Efficiency/Operational Cost Comparison chart.
- System variations such as a system without a boiler, variable pumping, and VAV for interior use.

Ground water systems

To utilize Aquazone™ units in ground water applications, extended range should be specified. This will provide factory-installed insulation on the coaxial coil to prevent condensate from dripping when entering water temperatures are below 15 C. In addition, the copper coaxial coil installed on the Aquazone units may not be suitable for all water conditions. Refer to the Water Conditioning section for proper coaxial coil material selection.

Surface water system — This system is typically located near a lake or pond. In this application, the loop can be submerged in a series of coils beneath the water surface. The number of coils required depends on system load and design. This application requires minimum piping and excavation.

Open loop system — This system is used where ground water is plentiful. In this application, ground water is pumped through supply piping from the well to the building. The water is then pumped back into the ground through a discharge well as it leaves the building. An additional heat exchanger is usually installed between the building water piping system and the ground water piping system. This design limits the amount of piping and excavation required.

Aquazone units are provided with a standard TXV and are rated to extremely low temperatures to self-adjust the refrigeration circuit; therefore water regulating valves are not required on open loop systems. To conserve water on this type of system, a slow opening/closing solenoid valve is recommended.

Ground loop systems

There are many commonly specified designs for ground loop applications. Typical designs include vertical loops and horizontal loops. In some applications, water is piped from the ground or lake directly to the water source heat pump. Piping is limited to the amount of pipe required to get the water from the source to the unit.

NOTE: When utilizing Aquazone water source heat pumps in ground loop systems, refer to design considerations in the ground water system section.

Horizontal ground loop — This system is used when adequate space is available and trenching can be easily accomplished. A series of parallel pipes are laid out in trenches 1 to 2 meters feet below the ground surface, and then back-filled. Often, multiple pipes are used to maximize the heat transfer capability of each trench. The amount of pipe and the size of the ground loop field are based on ground conditions, heating, and cooling requirements of the application and system design.

Vertical ground loop — This system is used in vertical borehole applications. This design is well suited for retrofit applications when space is limited or where landscaping is already complete and minimum disruption of the site is desired. The vertical ground loop system contains a single loop of pipe inserted into a hole. The hole is back-filled and grouted after the pipe is inserted. The completed loop is concealed below ground. The number of loops required depends on ground conditions, heating and cooling requirements, and the depth of each hole.

Hybrid systems — In some applications, it may be beneficial to incorporate a cooling tower into the ground loop system to reduce the overall cost. A Hybrid System discards excess heat into the air and increases the cooling performance of the ground loop.

Condensate drainage

Venting — Condensate lines should be properly vented to prevent fan pressure from causing water to hang up in the piping. Condensate lines should be pitched to assure full drainage of condensate under all load conditions. Chemical treatment should be provided to remove algae in the condensate pans and drains in geographical areas that are conducive to algae growth.

Trapping — Condensate trapping is essential on every water source heat pump unit. A trap is provided to prevent the backflow of moisture from the condensate pan and into the fan intake or downstream into the mechanical system. The water seal or the length of the trap depends on the positive or negative pressure on the drain pan. As a rule of thumb, the water seal should be sized for 25.4 mm for every 249 Pa of negative pressure on the unit. The water seal is the distance from the bottom of the unit condensate piping connection to the bottom of the condensate drain line run-out piping. Therefore, the trap size should be double the water seal dimension.

Horizontal units — Horizontal units should be sloped toward the drain at a 6.4 mm per 30 cm pitch. If it is not possible to meet the pitch requirement, a condensate pump should be designed and installed at the unit to pump condensate to a building drain. Horizontal units are not internally trapped; therefore an external trap is necessary. Each unit must be installed with its own individual trap and means to flush or blowout the condensate drain. The design of a common trap or vent for multiple units is not acceptable. The condensate piping system should not be designed with a pipe size smaller than the drain connection pipe size.

Water conditioning

In some applications, maintaining proper water quality may require the use of higher corrosion protection for the water-to-refrigerant heat exchanger. Water quality varies from location to location and is unique for each job. Water characteristics such as pH value, alkalinity, hardness, and specific conductance are of importance when considering any WSHP application. Water typically includes impurities and hardness that must be removed. The required treatment will depend on the water quality as well as type of system. Water problems fall into three main categories:

1. Scale formation caused by hard water reduces the heat transfer rate and increases the water pressure drop through the heat exchanger. As water is heated, minerals and salts are precipitated from a solution and deposited on the inside surface of the pipe or tube.
2. Corrosion is caused by absorption of gases from the air coupled with water on exposed metal. Corrosion is also common in salt-water areas.
3. Organic growths such as algae can reduce the heat transfer rate by forming an insulating coating on the inside tube surface. Algae can also promote corrosion by pitting.

NOTE: In most commercial water loop applications, Aquazone™ WSHP units use copper water-to-refrigerant heat exchanger. Units can also be equipped with a cupronickel heat exchanger for applications where water is outside the standard contaminant limits for a copper heat exchanger.

WATER QUALITY GUIDELINES

CONDITION	ACCEPTABLE LEVEL		
pH	7 to 9 range for copper. Cupronickel may be used in the 5 to 9 range.		
Total Hardness	Calcium and magnesium carbonate should not exceed 350 ppm.		
Iron Oxides	Less than 1 ppm.		
Iron Bacteria	No level allowable.		
Corrosion*		Max Allowable Level	Coaxial Metal
	Ammonia, Ammonium Hydroxide	0.5 ppm	Cu
	Ammonium Chloride, Ammonium Nitrate	0.5 ppm	Cu
	Ammonium Sulfate	0.5 ppm	Cu
	Chlorine/Chlorides	0.5 ppm	CuNi
	Hydrogen Sulfide†	None Allowable	—
Brackish	Use Cupronickel heat exchanger when concentrations of calcium or sodium chloride are greater than 125 ppm are present. (Seawater is approximately 25,000 ppm.)		

*If the concentration of these corrosives exceeds the maximum allowable level, then the potential for serious corrosion problems exists.

†Sulfides in the water quickly oxidize when exposed to air, requiring that no agitation occur as the sample is taken. Unless tested immediately at the site, the sample will require stabilization with a few drops of one Molar zinc acetate solution, allowing accurate sulfide determination up to 24 hours after sampling. A low pH and high alkalinity cause system problems, even when both values are within ranges shown. The term pH refers to the acidity, basicity, or neutrality of the water supply. Below 7.0, the water is considered to be acidic. Above 7.0, water is considered to be basic. Neutral water contains a pH of 7.0.

NOTE: Hardness in mg/l is equivalent to ppm.

Acoustical design

Sound power levels represent the sound as it is produced by the source, the WSHP unit, with no regard to attenuation between the source and the space. Acoustical design goals are necessary to provide criteria for occupied spaces where people can be comfortable and communicate effectively over the background noise of the air-conditioning system and other background noise sources.

Acoustical design goals are desirable sound pressure levels within a given conditioned space and are represented by Noise Criteria (NC) curves. Noise Criteria (NC) curve levels represent a peak over a full spectrum of frequencies. A high value in a low frequency band has the same effect on NC level as a lower value in a high frequency band. It is important that sound levels be balanced over the entire spectrum relative to the NC curve. The lower the NC criteria curve, the more stringent the room acoustical design must be to meet the design goals.

It is important to know how to convert NC levels from the unit ratings in terms of sound power (Lw). This conversion depends on the specifics of the acoustical environment of the installation.

The resulting calculations are compared to the NC curve selected for the area to assess the acoustical design.

Some of the factors that affect conversion of sound power to sound pressure and consequent NC level include:

- Type of acoustical ceiling
- Use of metal or flex duct
- Absorption in the occupied space
- Location in the occupied space
- Open or closed layout plan
- Use of open or ducted returns
- Orientation of unit to occupant
- Use of lined or unlined duct

Application data (cont)

OCTAVE BAND SOUND PRESSURE LEVEL (Lp) ASSOCIATED WITH NC CURVES

NOISE CRITERIA CURVES	OCTAVE BAND SOUND PRESSURE LEVEL (Lp)							
	Frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
NC-15	49	36	26	17	17	14	12	11
NC-20	52	41	33	27	22	19	17	16
NC-25	54	45	38	31	27	24	22	21
NC-30	58	49	41	36	31	29	28	27
NC-35	61	53	45	40	36	34	33	32
NC-40	64	57	50	45	41	39	38	37
NC-45	67	61	54	49	46	44	43	42
NC-50	71	64	58	54	51	49	48	47
NC-55	74	68	63	58	56	54	53	52
NC-60	77	71	67	63	61	59	58	57
NC-65	80	75	71	68	66	64	63	62

WSHP sound control

The analysis of the projected sound level in the conditioned space caused by a WSHP unit located in a ceiling plenum is quite involved. The key is to have good sound power ratings (Lw) in dB on the equipment to determine the sound attenuation effect of the ductwork, ceiling and room. In combination with utilizing standard Aquazone™ equipment attenuating features or the advanced mute package features, suggestions for horizontal and vertical unit sound design are provided to design around the WSHP units.

Horizontal units

Use the following guidelines for layout of Aquazone horizontal units to minimize noise:

1. Obtain sound power ratings in accordance with latest standards from manufacturers to select quietest equipment.
2. Do not locate units over a space with a required NC of 40 or less. Instead, locate units above less sensitive noise areas such as above or in equipment rooms, utility closets, restrooms, storage rooms, or above corridors.
3. Provide at least 3 meters between WSHP units to avoid the additive effect of two noise sources.
4. Provide an acoustical pad underneath the WSHP unit in applications where the unit must be mounted above noise sensitive areas such as private offices or conference rooms. The pad attenuates radiated noise. Be sure the pad has an area at least twice that of the WSHP footprint.
5. Maximize the installed height above the suspended ceiling.
6. Be sure the WSHP unit is located at least 2 meters away from any ceiling return grille to prevent line-of-sight casing noise to reach the space below.
7. Suspend the WSHP unit from the ceiling with hangers that utilize spring or neoprene type isolators to reduce vibration transmission.
8. Utilize flexible electrical connections to the WSHP unit. DO NOT USE NOT RIGID CONNECTIONS.
9. Utilize flexible loop water and condensate piping connections to the WSHP unit.
10. Use a canvas duct connector to connect the WSHP discharge to the downstream duct system. This reduces vibration-induced noise.
11. Provide acoustic interior lining for the first 6 meters of discharge duct, or until the first elbow is reached. The elbow prevents line-of-site sound transmission in the discharge duct.
12. Provide turning vanes in ductwork elbows and tees to reduce air turbulence.
13. Size the sheet metal supply duct with velocities no greater than 5 m/s.
14. Ensure ductwork is rigid.
15. Use round duct whenever possible to further reduce noise.
16. Allow at least 3 equivalent duct diameters of straight duct upstream and downstream of the unit before allowing any fittings, transitions, etc.
17. Seal all penetrations around duct entering the space.
18. Provide a 1.2 meter run-out duct made of flexible material to connect a diffuser to the supply trunk duct. The flex duct provides an "attenuating end-effect" and reduces duct-transmitted sound before it reaches the space. Typically a 6 db sound reduction can be accomplished with the use of flex duct.
19. Locate the run-out duct balancing damper as far away from the outlet diffuser as possible. Locating the balancing damper at the trunk duct exit is the best location.
20. If return air is drawn through a ceiling plenum, provide an acoustically lined return duct elbow or "L" shaped boot at the WSHP to eliminate line-of-sight noise into the ceiling cavity and possible through ceiling return air grilles. Face the elbow or boot away from the nearest adjacent WSHP unit to prevent additive noise.
21. Do not hang suspended ceiling from the ductwork.

Solenoid valves

In applications using variable flow pumping, solenoid valves can be field installed and operated from the control board in the Aquazone WSHP unit.

Freeze protection

Applications where systems are exposed to outdoor temperatures below freezing (0° C) must be protected from freezing. The most common method of protecting water systems from freezing is adding glycol concentrations into the water. Design care should be used when selecting both the type and concentrations of glycol utilized due to the following:

- Equipment and performance may suffer with high concentrations of glycol and other antifreeze solutions
- Loss of piping pressure may increase greatly, resulting in higher pumping costs
- Higher viscosity of the mixture may cause excess corrosion and wear on the entire system
- Acidity of the water may be greatly increased, promoting corrosion
- Glycol promotes galvanic corrosion in systems of dissimilar metals. The result is corrosion of one metal by the other, causing leaks.

Guide specifications

R-407C
Packaged Water Source Heat Pumps

HVAC Guide Specifications

Size Range: **1.5 to 13.7 kW Cooling Capacity**
1.8 to 16.8 kW Heating Capacity

Carrier Unit: **50RHE**

Part 1 — General

1.01 SYSTEM DESCRIPTION

A. Install Water Source Heat Pumps, as indicated on the plans with capacities and characteristics as listed in the schedule and the specifications that follow. Units shall be Carrier unit 50RHE horizontal configuration.

B. Units shall be supplied completely factory built and capable of operation with an entering water temperature range from 15.6 to 35 C as standard –6.7 to 43.3 C extended range).

Equivalent units from other manufacturers can be proposed provided approval to bid is given 10 days prior to bid closing.

C. Units shall be individually packaged with wooden skid covered with protective corner posts and plastic stretch wrapping for maximum protection.

1.02 QUALITY ASSURANCE

A. All equipment listed in this section must be rated in accordance with ISO 13256-1 performance standard. The units shall have CE conformity mark.

B. All units shall be factory tested under normal operating conditions at nominal water flow rates. This testing shall generate a report card to be shipped with each unit stating performance in both Heating and Cooling modes.

C. Serial numbers will be recorded by factory and furnished to contractor for ease of unit warranty status. Units which are tested without water flow rates are not acceptable.

Part 2 — Product

2.01 EQUIPMENT

A. General:

1. The horizontal heat pumps shall be fabricated from heavy gage galvanized sheet metal. All interior surfaces shall be lined with $^1/_2$ in. thick, $1^1/_2$ lb (12.7 mm thick, 0.7 kg) acoustic type fiberglass insulation. All fiberglass shall be coated and have exposed edges tucked under flanges to prevent the introduction of glass fibers into the airstream. All insulation must meet NFPA 90A (U.S.A. standard).
2. Units shall be prewired and precharged in factory.

B. Unit Cabinet:

1. Units must have the ability to be field convertible from side to back or back to side discharge with no additional parts or unit structure modification. Units will have factory-installed hanger brackets and isolation grommets.
2. Horizontal Units shall have one of the following airflow arrangements: Right-Discharge/Left-Return; Left-Discharge/Right-Discharge Return; Back-Discharge/Left-Return; or Back-Discharge/Right-Return as shown on the plans.
3. If units with these arrangements are not used, the contractor is responsible for any extra costs incurred by other trades.
4. Cabinets shall have separate openings and knockouts for entrance of line voltage and low voltage control wiring. Contractor must ensure that units can be easily removed for servicing and coordinate locations of electrical conduit and lights with the electrical contractor.
5. All units must have a minimum of three access panels for serviceability of compressor compartment. If other arrangements make servicing difficult, the contractor must provide access panels and clear routes to ease service. Architect must approve any changes in layout.
6. All units must have an insulated panel separating the fan compartment from the compressor compartment.
7. Optional Mute package shall consist of high technology sound attenuating materials that are strategically applied to the cabinet, in addition to the standard system, to further dampen sound.
8. Units with the compressor in the airstream are not acceptable.

C. Fan and Motor Assembly:

1. Units rated 14 kW and under shall have a direct-drive centrifugal fan. The fan motor shall be 3-speed, permanently lubricated, PSC (permanent split capacitor) type with internal thermal overload protection.
2. Blower shall have inlet rings to allow removal of wheel and motor from one side without removing housing.
3. Units supplied without permanently lubricated motors must provide external oilers for easy service.
4. The fan motor shall be isolated from the fan housing by torsionally flexible isolation grommets. The fan and motor assembly must be capable of overcoming the external static pressures as shown on the schedule.
5. Airflow/Static pressure rating of the unit shall be based on a wet coil and a clean filter in place.

Guide specifications (cont)

D. Refrigerant Components:

1. Units shall have a sealed refrigerant circuit including a high efficient scroll, rotary or reciprocating compressor designed for heat pump operation. Units shall be designed with environmentally friendly HFC-407C refrigerant.
2. Units shall have a thermostatic expansion valve for refrigerant metering, an enhanced aluminum lanced fin and rifled copper tube refrigerant to air heat exchanger, a reversing valve, a coaxial (tube-in-tube) refrigerant-to-water heat exchanger.
3. Hermetic reciprocating compressors shall be internally sprung. The compressor will be mounted on external computer selected isolating springs. The external springs will be secured to rails that are isolated from the cabinet base. Compressor shall have thermal overload protection and be located in an insulated compartment away from airstream to minimize sound transmission.
4. Refrigerant-to-air heat exchangers shall utilize enhanced lanced aluminum fins and rifled copper tube construction rated to withstand 3100 kPa refrigerant working pressure.
5. Refrigerant-to-water heat exchangers shall be of copper inner-water tube and steel refrigerant outer tube design, rated to withstand 3100 kPa working refrigerant pressure and 3100 kPa working water pressure. Plate-to-plate heat exchangers cannot be used.
6. Refrigerant metering shall be accomplished by thermostatic expansion valve only. Units intended for use in standard operating range with entering water temperatures from 15.6 to 35 F.
7. Reversing valves shall be four-way solenoid activated refrigerant valves which shall fail to heating operation should the solenoid fail to function. If the reversing valve solenoid fails to cooling, a low temperature thermostat must be provided to prevent over-cooling an already cold room.
8. Optional cupronickel coaxial water-to-refrigerant heat exchangers.
9. Optional Extended Range for units operating with entering water temperatures below dew point. For use in operating range with entering water temperatures from –6.7 to 43.3 C.
10. Optional two-way water control valve.
11. Water circuit options to provide internally mounted 0.045 or 0.054 1/s per kW automatic flow regulating valves.

E. Drain Pan:

The drain pan shall be constructed to inhibit corrosion and is fully insulated. Drain outlet shall be located on pan as to allow complete and unobstructed drainage of condensate. Vertical units will be supplied with factory-installed trap inside of cabinet. The unit as standard will be supplied with solid-state electronic condensate overflow protection. Mechanical float switches are not acceptable.

F. Filter:

1. Units shall have a factory installed 25.4 mm wide filter bracket for filter removal from either side. Units shall have a 25.4 mm. thick throwaway type fiberglass filter.
2. The contractor shall purchase one spare set of filters and replace factory shipped filters on completion of start-up.
3. Field installed 50.8 mm filter brackets and 50.8 mm fiberglass throwaway filters on all units can be installed by contractor.

G. High-Static Blower:

Provides increased airflow at various static pressure conditions. Available in size 048.

H. Controls and Safeties:

1. Electrical:
   a. A control box shall be located within the unit compressor compartment and shall contain a 50 va transformer, 24-volt activated, 2 or 3 pole compressor contactor, terminal block for thermostat wiring and solid-state controller for complete unit operation. Electromechanical operation is not acceptable.
   b. Units shall be nameplated for use with time-delay fuses or HACR circuit breakers. Unit controls shall be 24-volt and provide heating or cooling as required by the remote thermostat/sensor.
2. Piping:
   a. Supply and return water connections shall be copper FPT fittings and shall be securely mounted flush to the cabinet corner post allowing for connection to a flexible hose without the use of a back-up wrench.
   b. All water connections and electrical knockouts must be in the compressor compartment corner post as to not interfere with the serviceability of unit. Contractor shall be responsible for any extra costs involved in the installation of units that do not have this feature.

3. Unit Controls:
   a. Safety controls including a high-pressure switch, a low-pressure sensor, and a low water and low air temperature sensor. Access fittings shall be factory installed on high and low pressure refrigerant lines to facilitate field service.
   b. Activation of any safety device shall prevent compressor operation via a lockout device. The lockout shall be reset at the thermostat or at the contractor-supplied disconnect switch.
   c. Units which may be reset only at the disconnect switch only shall not be acceptable.
4. The standard Complete C control electronic control system shall interface with a heat pump (Y,O) wall thermostat (mechanical or electronic). The control system microprocessor board shall be specifically designed to protect against building electrical system noise contamination, EMI, and RFI interference. The control system shall have the following features:
   a. 50 VA transformer.
   b. Performance Monitor (PM). The PM warns when the heat pump is running inefficiently.
   c. Anti-short cycle time delay on compressor operation time delay shall be 5 minutes minimum.
   d. Random start on power up mode.
   e. Low voltage protection.
   f. High voltage protection.
   g. Unit shutdown on high or low refrigerant pressures.
   h. Unit shutdown on low water temperature.
   i. Water coil freeze protection (selectable for water or antifreeze).
   j. Air coil freeze protection (check filter switch).
   k. Condensate overflow shutdown.
   l. Option to reset unit at thermostat or disconnect. Fault type shall be retained in memory if reset at thermostat.
   m. Automatic intelligent reset. Unit shall automatically reset 5 minutes after trip if the fault has cleared. Should a fault reoccur 3 times sequentially then permanent lockout will occur.
   n. Ability to defeat time delays for servicing.
   o. Light-emitting diodes (LEDs) to indicate high pressure, low pressure, low voltage, high voltage, air/water freeze protection, condensate overflow and control status.
   p. The low-pressure switch SHALL NOT be monitored for the first 90 seconds after a compressor start command to prevent nuisance safety trips.
   q. Remote fault type indication at thermostat.
   r. Selectable 24-v or pilot duty dry contact alarm output.
   s. 24-v output to cycle a motorized water valve with compressor contactor.
   t. Electric heat output to control two stages of electric heat.
   u. Service test mode for troubleshooting and service.
5. Optional electronic Deluxe D Control shall have all the features of the Complete C control with the following additional features:
   a. 75 VA transformer.
   b. A removable thermostat connector.
   c. Random start on return from night setback.
   d. Intelligent reversing valve operation for extended life and quiet operation.
   e. Night setback control from low temperature thermostat, with 2-hour override initiated by a momentary signal from the thermostat.
   f. Dry contact night setback output for digital night setback thermostats.
   g. Ability to work with heat/cool (Y, W) thermostats.
   h. Ability to work with heat pump thermostats using O or B reversing valve control.
   i. Single grounded wire to initiate night setback, or emergency shutdown.
   j. Boilerless system control can switch automatically to electric heat at low loop water temperature.
   k. Dehumidistat input providing fan control for dehumidification operating.
   l. Multiple units connected to one sensor providing communication for up to 3 water source heat pumps.
   m. Selection of boilerless changeover temperature set point.
   n. Compressor relay staging for dual stage units or in master/slave applications.

I. Special Features:
1. Thermostat Controls:
   a. Programmable multi-stage thermostat with 7-day clock, holiday scheduling, large backlit display and remote sensor capability.
   b. Programmable 7-Day Light Activated Thermostat offers occupied comfort settings with lights on, unoccupied energy savings with lights off.
   c. Programmable 7-Day Flush Mount Thermostat offers locking coverplate with tamper proof screws, flush to wall mount, dual point with adjustable deadband, O or B terminal, and optional remote sensor.

Guide specifications (cont)

d. Programmable 5-Day Thermostat offers 2 stage heat, 2 stage cool, auto changeover, 5-minute built-in compressor protection, locking cover included.

e. Non-programmable Thermostat with 2 heat stages, 2 cool stages, auto changeover, 5-minute built-in compressor protection, locking cover included.

2. Loop Controller with six stages (2 stages for heating and 4 stages for heat rejection).
3. Filter Rack (50.8 mm) to enhance the filtration system of the water source heat pump.

   NOTE: Filter rack does not include filters.

Manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligations.